



SATURDAY, FEBRUARY 28, 1874.

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## CATECHISM OF THE LOCOMOTIVE.

By M. N. FORNEY, Mechanical Engineer.

## PART VI.

## GENERAL DESCRIPTION OF A LOCOMOTIVE ENGINE.

QUESTION 60. What are the principal parts of an ordinary locomotive engine?

*Answer.* A boiler for generating steam and a pair of high-pressure steam engines, which are all mounted on a suitable frame and wheels adapted for running on a track consisting of two iron or steel rails.

QUESTION 61. How is the power of high-pressure engines applied to locomotives?

*Answer.* By connecting the engines with the wheels so as to give the latter a rotary motion.

QUESTION 62. When they revolve, what will occur?

*Answer.* Either they will slip on the track, or the locomotive will move either backward or forward, according to the direction the wheels are turning.

QUESTION 63. What will determine whether the wheels will slip or the locomotive move?

*Answer.* The friction, or adhesion, as it is called, between the wheels and the track. If this adhesion is greater than the resistance opposed to the movement of the locomotive, the latter will overcome the resistance; but if the latter is greater than the friction, the wheels will slip.

QUESTION 64. Upon what does the amount of friction or adhesion of the wheels depend?

*Answer.* Chiefly on the weight which they bear, but to some extent upon the condition of the rails. Under ordinary circumstances, the adhesion of the wheels of a locomotive is in direct proportion to the weight they carry.

QUESTION 65. Why are two cylinders employed on locomotives?

*Answer.* Because if only one was used, it would be impossible, or very difficult to start the engine, if it should stop on one of the dead points.

QUESTION 66. How is this difficulty overcome by the use of two cylinders?

*Answer.* By attaching the two cranks to the same shaft or axle, and placing them at right angles to each other, so that when the one is at a dead point the other is in the position where the steam can exert the maximum power on the crank.

QUESTION 67. How are the cranks of an ordinary locomotive made?

*Answer.* They are cast in one piece with the wheels that drive the locomotive, which are therefore called driving-wheels. In this country the centre portion of such wheels, or wheel-centres, as they are called, is always made of cast iron, with tires of wrought iron or steel around the outside, and is fastened to the axles of the locomotive. The shaft of a locomotive engine is called the main driving-axle.

QUESTION 68. How are the cylinders and driving-wheels of a locomotive usually placed?

*Answer.* The cylinders (A, figs. 40, 42 and 43) are placed at the front end of the locomotive, and the main driving-axle, B, far enough behind them to permit the connecting rods, C, to be attached to pins, D, in the cranks, called crank-pins. In this country these cranks are now universally placed on the outside of the wheels, and therefore the cylinders must be placed far enough apart (as shown in figs. 42 and 43) to permit the connecting-rods to be attached to the crank-pins. Fig. 40 is a side view of an ordinary eight-wheeled American locomotive, fig. 41 a longitudinal section, fig. 42 a plan, and fig. 43 a transverse section through the cylinder and smoke-box.

QUESTION 69. What are the smaller wheels, E E, for?

*Answer.* They carry the weight of the cylinders and other parts of the front end of the locomotive, and serve to guide and steady the machine in a manner which will be more fully explained hereafter.

QUESTION 70. Why are more than one pair of driving wheels necessary for locomotives?

*Answer.* Because if the weight which is needed to create the requisite adhesion of the wheels of locomotives to pull heavy loads was placed on one pair of wheels, it would be so excessive as to partly crush and injure the rails. It is there-

fore distributed, usually on two pairs, but sometimes on three or four or even more pairs.

QUESTION 71. Where is the second pair of driving wheels usually placed?

*Answer.* These wheels, F—called the back or trailing driving-wheels—are, in the ordinary type of locomotives used in this country, situated behind the main driving wheels, far enough back to give the room necessary for the boiler, G, between the two axles, as shown in figs. 40, 41 and 42.

QUESTION 72. How are the axles, cylinders, etc., held in the right position in relation to each other?

*Answer.* By longitudinal frames, H, H, H, H (figs. 40, 41, 42 and 43), which hold the axles in the proper position, and are bolted to the cylinders, and also fastened to the boiler at I, I (figs. 40 and 42).

QUESTION 73. How is a locomotive engine made to run either backward or forward?

*Answer.* By having two eccentrics, J, J, fig. 42 (also shown in fig. 41), for each cylinder. One of these is fixed or set on the shaft in such a position as to move the valve so that the engine will run in one direction; the other eccentric is set so that the engine will run the reverse way. The ends of the two eccentric rods are attached to what is called a link, L (figs. 40, 41 and 42), the object of which is to furnish the means of quickly engaging and disengaging either eccentric rod to or from the rocker, K. The link is operated by a system of levers, consisting of the lifting shaft, M, and arms, N, N, and the reverse lever, O, O (fig. 41). The principles and

air the smoke which passes through the flues, and partly for producing a strong draft of air, which is indispensably necessary for the rapid combustion of the fuel, and also for collecting and extinguishing the sparks from the fire.

QUESTION 76. How is the draft produced in locomotive boilers?

*Answer.* By conducting the exhaust steam through pipes (e, e, fig. 43) from the cylinders to the smoke-box and allowing it to escape up the smoke-stack from apertures, f, f (figs. 41 and 43) called exhaust-nozzles. The strong current of steam thus produced in the smoke-stack produces a vacuum, by which the smoke is sucked into the smoke-stack with great power and forced into the open air.

QUESTION 77. How are the water and fuel carried which must be supplied to a locomotive while it is running?

*Answer.* The water is carried in a tank, which is constructed in the form of the letter U, so as to give room for the stowage of fuel between its two branches or sides. This tank is carried on a set of wheels, and forms a separate vehicle independent of the locomotive, called a tender.

QUESTION 78. What are the dimensions of the principal parts of a locomotive?

*Answer.* There is a great variety in the plan, size and capacity of locomotives, but the type which is more generally used in this country than any other, and which has been selected for the preceding illustrations, and will be described in the succeeding chapters of the Catechism, has four driving and four truck-wheels, and weighs in working condition about

60,000 lbs. The following are the dimensions of its principal parts: The driving-wheels are about 5 feet and the truck-wheels from 26 to 30 inches in diameter. The longitudinal distance between the centres of the driving-wheels is usually about 7 feet, and between the centres of the truck-wheels 5 ft. 9 in., and the total distance from the centre of the back driving-wheels to the centre of the front truck-wheels, which is called the wheel-base, is 21 ft. 8 in. The weight on each driving-wheel is usually about 10,000 lbs., and on each truck-wheel about 5,000 lbs. The cylinders are 16 in. in diameter and the piston has 24 in. stroke, and the connecting-rod is 7 ft. long measured between the centres of the pins to which it is attached. The centres of the cylinders are about 6 feet apart, measured across the track. The fire-box inside is 5 ft. long and 2 ft. 11 in. wide, and the cylindrical part of the boiler is 4 ft. in diameter measured on the outside of the smallest portion. The water spaces around the fire-box are about 3 in. wide. There are 140 tubes, which are 2 in. in diameter measured on their outside, and 11 ft. long. The inside of the smoke-stack is 16 in. in diameter, and it is 14 ft. 3 in. high measured from the top of the rails. The tender carries about

1,800 gallons of water and about 8,000 lbs. of coal. When loaded it weighs about 40,000 lbs., making the total weight of the engine and tender 100,000 lbs.

## The Master Mechanics' Association—Circulars of Inquiry.

The following additional circulars of committees have been published:

## THE OPERATION AND MANAGEMENT OF LOCOMOTIVE BOILERS, INCLUDING THE PURIFICATION OF WATER.

By reference to the reports and discussions, you will not fail to notice that each year marks an advancement towards a solution of the subject of boiler incrustation, and while the Committee feel greatly encouraged, they likewise realize the necessity of still further investigation. It is hoped, therefore, that each member will take the following questions under careful consideration, and by contributing one or more facts, assist in arriving at a satisfactory conclusion:

1st. Is it, in your opinion, practicable to purify water for locomotive boilers at watering stations on the line of your road? If so, by what means?

2d. Do you consider it practicable to store rain-water in reservoirs? If so, what form of reservoir would you recommend, and what, in your opinion, would be the expense of a permanent fixture of this kind?

3d. Would not the use of rain-water entirely overcome the evil of incrustation?

4th. Do you believe any mechanical or chemical means can be practically and economically employed, by heat or otherwise, to effectually purify water for locomotive use?

5th. Has your experience in the use of boiler compounds demonstrated that such nostrums can become a practicable, cheap and effect remedy for the evil in question?

6th. Has your experience with the mud drum, since the meeting of the last convention, developed any new facts in its favor?

7th. What means have you adopted for removing scale or incrustation, and what would you recommend?

8th. What method of staying crown sheets, other than the ordinary way, would you advise as a means of preventing the accumulation of mud and scale?

The Committee will be pleased to receive samples of incrustation for analysis (and for the benefit of the Mechanical Laboratory), which please label with name of road and mileage of engine in which they accumulated. Also please send, if possi-

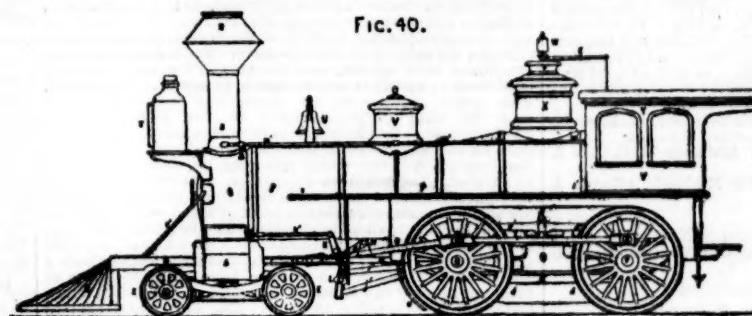


FIG. 40.

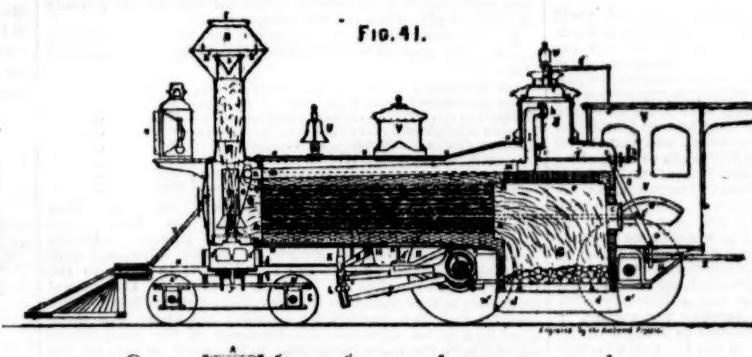


FIG. 41.

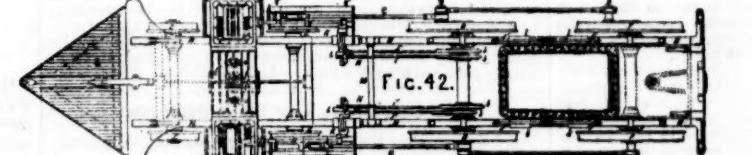


FIG. 42.

working of these will be more fully explained hereafter.

QUESTION 74. What are the principal parts or "organs" of a locomotive boiler?

*Answer.* 1. A fire place, or, as it is called, a fire-box, G,

(fig. 41), which is surrounded with water.

2. A cylindrical part P, P, (figs. 40 and 41) attached to the fire-box at one end and to a chamber, Q, called the smoke-box, at the other.

3. Of the tubes or flues a, a', (figs. 41 and 43), which connect the fire-box with the smoke-box and pass through the cylindrical part of the boiler and are surrounded with water.

4. The smoke-stack, or chimney R, R.

QUESTION 75. What is each of these parts or organs for, and of what do they consist?

*Answer.* The fire-box G furnishes the room for burning the fuel, and consists of an inner and outer shell made of boiler plate, with the space between the two filled with water; a grate, p, p, (fig. 41) formed of cast-iron bars, with spaces between them for admitting air for the combustion of the fuel, which is placed on the top of them; a door C, called the furnace-door, for supplying the grate with fuel; a receptacle, d, d, below the grate, to collect ashes, and therefore called the ashpan, which is supplied with suitable dampers, n', n', for admitting or excluding the air from the fire.

The cylindrical part P, P, or waist of the boiler as it is sometimes called, contains the greater part of the water to be heated.

The tubes or flues, as they are sometimes called, of which a locomotive has from one to two hundred, are usually two inches in diameter, and about eleven feet long. They conduct the smoke and products of combustion from the fire-box to the smoke-box. These tubes are made of small diameter so as to sub-divide the smoke into many small streams and thus expose it to a large radiating surface through which the heat is conducted to the water.

The smoke-stack serves partly for removing into the open

ble, an analysis of the water used in engines on your road, name or place from which it was taken, and its effects upon your boilers.

#### Management of Steam Boilers.

1st. What, in your opinion, should be the maximum or working pressure of boilers as built by locomotive builders of this country?

2d. As a means of greater safety, should not every steam boiler be provided with a water gauge in addition to the usual gauge cocks?

3d. Do you consider low-water detectors, as at present manufactured, reliable; and would you recommend their application to all steam boilers? If you have ever used them, please state your experience.

4th. What has been your experience with super-heaters? Are they desirable, and can they be so attached to locomotives as to become efficient, practicable and cheap?

5th. Do you know of any lagging for locomotive boilers and cylinders better than wood, to prevent the radiation of heat?

6th. What is your opinion of asbestos, or any other felting, as a covering for steam pipes, stationary boilers, etc.?

H. A. TOWNE, Northern Pacific.  
A. H. DE CLERQ, Toledo, Peoria & Warsaw,  
H. ELLIOTT, Ohio & Mississippi,  
COLEMAN SELLERS, Philadelphia,  
T. W. PEEPLES, Central of New Jersey,

Committee.

Please address your reply to H. A. TOWNE, St. Paul, Minn.

#### FUEL CONSUMPTION AND PROPORTION OF FIRE-BOX AND TUBE SURFACE TO GRATE SURFACE.

The undersigned having been appointed by the American Railway Master Mechanics' Association, at their convention held at Baltimore in May, 1873, a Committee "On the Actual Consumption and Cost of each Kind of Fuel used per Mile run, per Weight of Train hauled, including Cars; also, the Best Form and Proportion of Fire-box, and Proper Proportion of Tube Surface to Grate Surface Requisite to Produce the Best Results with each Kind of Fuel," the Committee respectfully ask a full expression of your experience and opinions in reply to all the questions on this subject, so that a report may be made that shall be complete, and thereby of value and interest to the Association.

Respectfully yours,

CHAS. GRAHAM, Master Mechanic Delaware, Lackawanna & Western Railroad, Bloomsburg Division,  
L. S. YOUNG, General Master Mechanic C. C. C. & I. Railroad,  
B. H. KIDDER, General Master Mechanic Atlantic & Great Western Railroad,

Committee.

Address your replies to CHAS. GRAHAM, Master Mechanic Delaware, Lackawanna & Western Railroad, Bloomsburg Division, Kingston, Pa.

#### Speed on the English Railroads

We have frequently referred to the greatly increased speed at which the principal express trains on our great iron highways are now being worked. It would seem, indeed, that the companies are actuated entirely by a desire to serve a small section of the traveling public who prefer traveling by fast trains, with all the greater risks to which, as experience has lately taught us, express trains traveling at a high speed are exposed. We were able to intimate as long ago as March last that the subject of the reduction of the speed, and also of the number, of the costly through express trains run to competing points had engaged the attention of the railway authorities, but nothing definite had resulted from the negotiations. A further meeting with the same object was, however, to take place; but it would appear now that whatever form the deliberations at the further meeting took, whether as regards the speed, or a reduction of the number, nothing tending to bring about either object has been accomplished. As a principle it was laid down, and generally admitted, we believe, that a maximum limit of forty miles an hour was sufficiently high for the fastest express trains. This, we also understand, is the highest speed asked for by the postoffice in the case of the principal mail trains. Being merely in the form of a recommendation, the principle of a forty mile maximum was not, of course, binding, and none of the companies having taken the initiative as regards the competitive trains, the others could not follow, and things stand precisely as before.

It cannot be that the companies are maintaining these high speeds for the advantage of the traffic, for if the traveling public preferred the fast to the slow trains, still, if there were no fast trains, the number traveling would not be likely to diminish. Again, express trains are fearfully expensive to run, for, assuming there is no greater risk attached to them than to slow trains, they incur additional expense not only by their requiring a very superior class of rolling-stock, but a permanent way of a corresponding degree of excellence. At the same time they materially interfere with the working of the slower traffic which has to put up with all sorts of detentions in order that it may be kept safely out of the way of the fast trains. Neither can it be safely alleged that the public have encouraged particular companies to accelerate particular competitive trains, for if one company puts on a fast train to a point where another company is in competition the public will soon find that they can go by either line in just the same time, for the other company is never slow to retaliate by putting on an equally fast train. And where one company has a longer route to traverse than the other, it is quite easy to see, under these circumstances, how the issue of the competition may become really dangerous, and in a corresponding degree detrimental to the interests of the shareholders.

With the view of showing how the companies are acting under the influence of the insane spirit of competition that exists, it is well worth while to go through the time books of a few of the principal companies having termini in London and converging at competing points elsewhere. It is quite obvious that where there is no competition there is a minimum of speed, and the highest speeds are to be found where a company has a longer or more indirect route to any important point than the other competing companies. We find also that the limit of speed which was recommended at the meeting already referred to is enormously exceeded on the majority of the lines. At the same time, and with the report of Captain Tyler on the late Wigan accident before us, a state of things exists elsewhere, which, in the mildest terms, can only be stated as alarming. On referring to the company's time book, we find that on the section of the London & Northwestern line where this accident occurred—between Warrington and Preston—the speed of the train to which the accident happened, for the entire run over that portion of the line, without stopping, is only 38½ miles an hour. This is comparatively moderate for an express train. The same train travels over the section of line preceding that where the accident occurred—from Crewe to Warrington—a length of 24 miles, in 34 minutes, or at the rate of 42½ miles an hour. If we compare this speed, too, with what we find on other parts of the company's system, we find it is regularly exceeded, and even at places where the other traffic is heavier and the lines consequently more blocked than at Wigan. For instance, the 7.15 Irish morning mail runs from Euston to Rugby in one hour fifty-five minutes, the distance being 82½ miles, and at the average speed therefore of forty-three miles an hour. The Scottish morning express also travels on the same line from Rugby to Crewe at a speed exceeding forty-

five miles an hour. The London & Northwestern is, however, well situated as regards direct access to the various competitive points it reaches, and it is not with them, therefore, that we must look for the highest speeds. Of all of the three great northern lines the London & Northwestern are manifestly the slowest. The Midland Company advertise to run their morning express, starting from St. Pancras at ten o'clock, from Kentish-town to Bedford, in sixty-two minutes, the distance being 48½ miles, and showing an average rate, therefore, of 46½ miles an hour. Taking into account the excellent position which the Midland company holds as regards direct access to the more important competing points, it seems absurd that they should maintain so high a speed, except with the object of shutting out, at any cost, rival lines less advantageously situated. It is on the Great Northern line, however, that we find the issue of the competition that has for some time existed, and the consequent acceleration of the trains, culminating in a truly marvellous speed. This company now runs both its morning and evening Scotch express trains from London to Peterborough, a distance of 76½ miles, in an hour and a half, being at the average rate for the distance of 50½ miles per hour, or something like twelve miles an hour faster than the London & Northwestern tourist train had to average on the Wigan stage of its journey. The Great Northern Company, it must be remembered, are rather unfortunately situated with regard to access to Liverpool, Manchester and Glasgow, and are in consequence compelled to greatly expedite their trains in order to hold their own in point of time and in business with the rival companies. But even this apparently excessive speed of the Great Northern Company is eclipsed elsewhere, for we find the Great Western Company, in order to hold their own against the London & Southwestern Company, who have a shorter route by 23 miles to Exeter, are compelled to run a train starting from Paddington at 11:45, and arriving at the first stage—Swindon—a 1:12, the time occupied in doing the distance of 77½ miles being just 87 minutes. This is at the rate of 53½ miles an hour, and is probably the fastest train in the world. It is only, of course, at Exeter and the places beyond that this train is competitive with the corresponding London & Southwestern train, which occupies the same time on the journey. To all these places the companies have agreed, and do charge, the same fares by both routes; and it is not too much to say that they might, with great advantage to themselves, mutually agree that the time to be occupied in the journey should be increased. So long as both trains occupy the same time on the way, however much the speed may be reduced, the proportion of the traffic traveling by either would not be affected. The Southern companies, notwithstanding that they have numerous traffic agreements and other joint working arrangements, show that in point of speed it is much more difficult to come to an understanding. The Brighton Company, not to put down opposition (unless it be from fear of projected schemes of new lines), but simply to encourage and cultivate a special kind of traffic, run a train from London-bridge to Brighton in sixty-five minutes, the distance being 50½ miles, and the speed 46½ miles an hour. The continental express trains of the Southeastern and London, Chatham & Dover companies travel at an average speed throughout the journey of 44½ and 46½ miles per hour respectively.

The following shows, in their order, the maximum average speed of the express trains on the different lines referred to in this article:

Great Western.....	53½ miles an hour.
Great Northern.....	50½ "
Midland.....	46½ "
London & Brighton.....	46½ "
London, Chatham & Dover.....	46½ "
London & North Western.....	45 "
Southeastern.....	44½ "
London & South Western.....	43½ "

But surely when the companies can, as they are now doing, harmoniously agree in their rates and fares between all competitive points, whereby neither is calculated to secure an undue advantage over the other, it should be none the less difficult to agree to the time in which the journey is to be performed. The accommodation now provided for the traveling public in this country is certainly such as cannot be equalled elsewhere, but there must be a point at which the keenness of the competition which has in the main given rise to this superior care for the public interests should, in the interests of the shareholders, be moderated. The companies can run slower trains if they like, and still continue to give satisfaction to the public. By doing so they would also add materially to the general profit arising from working the lines.—*London Railway News.*

#### The Cost of Working State Railroads.

The *Moniteur des Intérêts Matériels*, of Brussels, commenting on the rise to 80 per cent. of the proportion of working expenses to receipts on the Belgian State Railroads in 1873, says:

It appears, in fact, from the statistics so carefully collected by the French Minister of Public Works, that there was in 1867 only one system of roads which cost, on an average, more than 62 per cent., and that was the Russian system worked by the State. These statistics show likewise that working by the State is everywhere more costly than working by corporations. There is no exception to this rule, as the following table will show:

Prussia.....	State, Companies.
Bavaria .....	50.25 45.35
Wurtemberg .....	57.59 37
Saxony .....	49.57 48.19
Germany (the average) .....	52.55 47.07
Belgium .....	50.70 46.12
Russia .....	61 59.72
Sweden .....	62.80 59.45
Switzerland .....	62.21 56.27
Average for all Europe.....	56.35 50.61
Average for all Europe.....	54.50 48.33

From these figures it appears that in 1867 we occupied the lowest rank, if we except Russia and Sweden, and that now we occupy it without any exception. It appears, further, that everywhere there is this identical result: working by the State is more difficult than by private industry. We shall have occasion to recur to this later observation.

But what renders this constant increase of expense still more painful is that it coincides with a parallel and also constant increase in the capital account, or cost of construction.

From 1865 to 1872, inclusive, 85 million francs were expended, which, divided on an average length of 1,000 kilometres worked during that period, gives an increase of 85,000 francs in the cost per kilometre (\$25,500 per mile).

There remained then, on open accounts, a surplus of sixteen millions due.

In 1873, by the law of February concerning public works, 41 millions more were voted: altogether 57 millions, which, divided among 1,500 kilometres (in round numbers), forms a new increase of 38,000 francs per kilometre (\$1,140 per mile). That is to say, in nine years the cost of construction per kilometre has risen by 123,000 francs, or 33 per cent. on 384,000 francs, which was at the former time the cost of the lines constructed by the State. [From \$115,200 to \$152,100 per mile, an increase of \$36,900.]

We do not know how much was spent in 1873 above the amount appropriated, which, as has been seen, was 57 millions.

But admitting an expenditure of 40 millions, 17 millions remaining unexpended, we will see:

- That the percentage of income on the capital invested in

the State Railroads is not more than 3.2 per cent.; that is to say, about 1 per cent. less than Belgium has to pay when borrowing it, notwithstanding its excellent credit.

2. That the sums expended on account of construction increase every year, while the working does not become easier and while the complaints of the public concerning the bad equipment of the State Railroads do not cease.

In the face of these results we will repeat what we said last year: There is a certain vice which hitherto is recognized only by the results which we suffer from: only a complete, absolute reorganization of the whole service could make it disappear.

But in what direction must we look for the bases of this reorganization? Perchance in a decentralization of the multiplied services of railroad business? Leaving to the State the higher management, the establishment of new lines—in a word, the route and the tariffs; abandon to private industry the working of the roads.

The examples cited above of workings by the State and by individuals indicate at least that there is reason for looking more willingly in this direction."

#### Contributions.

##### Alignment of Tunnels from the Bottom of a Shaft.

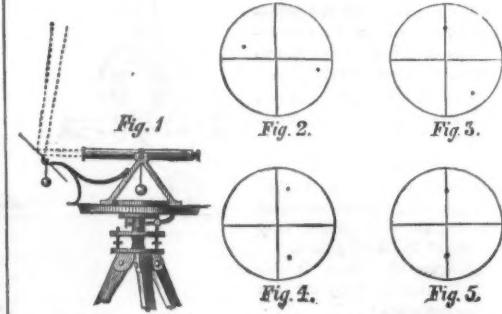
To THE EDITOR OF THE RAILROAD GAZETTE:

Allow me to offer for criticism the following plan for the alignment of tunnels, when the work is carried on from headings at the bottom of shafts.

Silliman states that "the incident ray, reflected ray, and a vertical to the reflecting surface at the point of meeting, are contained in the same plane;" and in the case of a plane reflector, this containing plane must be perpendicular to the reflecting surface. If, therefore, a *plane mirror* be mounted upon a horizontal axis parallel to its reflecting surface and an object viewed by reflection, the point whose apparent position is at the foot of a perpendicular to the axis of the mirror let fall from the eye upon the reflecting surface, will be contained in the same vertical plane as the eye; the point of the mirror at the reflected image, and the point itself.

Mounting the mirror upon a frame attached to the upper plate of a transit, with its axis parallel to the horizontal axis of the telescope, (substantially as shown in fig. 1,) we have the means of determining which of all the points, or rather what line, on the reflected view is contained in the same vertical plane as the line of collimation of the transit.

If the instrument as thus arranged be placed at the bottom of a vertical shaft, and so adjusted that a reflected view of the mouth, showing two points in the direction of the proposed tunnel, be seen through the telescope, these points will appear in the field, and their apparent direction from each other, as compared with the vertical wire of the telescope, will determine the position of the instrument with reference to the surface line.



If the instrument has been placed nearly at right angles to the surface line, the view shown in fig. 2 will be the result; turning upon the vertical axis until the vertical wire coincides with one or both points will give fig. 3 or 5, the latter showing that the vertical plane of the instrument coincides in direction with the surface line. The condition shown in fig. 4 requires a lateral motion of the instrument to bring it exactly under or in the same vertical plane as the surface line. The above effects are directly deducible from the principle and conditions stated. The practical success of the plan, however, will depend upon the possibility of realizing more or less perfectly all the conditions necessary, or upon the possibility of securing and retaining a perfect adjustment in the instrument, which we will consider.

As the true verticality of the incident ray from the visible point in the surface line depends upon the accurate leveling of the axis mirror, a delicate spirit level should be suspended from its axis and carefully adjusted. The telescope axis should be adjusted to a horizontal in the same manner.

Having leveled the axis of both mirror and telescope, the plane of the mirror must be set parallel to its axis. A reflected point viewed with pivots reversed will determine and show the error. The mirror axis must now be parallel to the axis of the telescope; an object viewed directly and by reflection will determine the error.

When the instrument is in perfect adjustment, a distant point viewed directly, and by reflection from the mirror in both positions, (pivots reversed), will be cut by the vertical wire of the telescope; and the bubbles of the two levels will remain on centre. These tests can be applied, an observation taken for line, and points fixed at the headings, without moving the instrument. Turning 180 degrees and repeating the process will eliminate instrumental error. The apparent angular motion of the surface line, as seen by reflection, is no greater than would be the case if the mouth of the shaft was viewed directly through a vertical telescope, and in that way the adjustment of the instrument in the plan of the surface line is no more delicate; but the possibility of eliminating errors by repeated reversals, and of testing the adjustments, taking the observation and locating a point in the lower line without altering the position of the telescope in the least, offer chances for extreme accuracy. In deep and large shafts two or three stations for the instru-

ment can be taken, giving four or six points on the lower line. The coincidence of all in the same straight line would give little less than absolute accuracy.

It would seem probable that the same principle of reversal by reflection might be applied to the delicate operation of prolonging a straight line from station to station, by allowing the incident ray to pass under the telescope, using a diagonal eyepiece to bring the eye above it. This method, as distinguished from others, uses points in the surface line directly to prolong the direction of that line under ground instead of transferring the line by points to the bottom, to be afterwards picked up and prolonged. The same instrument could be used to drop the points from the top, as is sometimes done with a transit having a telescope revolving outside the bearings; or a check could be taken in this manner on points already located from the bottom.

The above is given as an untried plan, the practicability of which appears perfect.

C.

#### Erection of Lattice and Plate-Girder Bridges.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of the 31st ult. there appeared an article headed "A New England Bridge," describing an iron railroad bridge recently built over the Winooski River, near Waterbury, Vt., for the Vermont Central Railroad, by Mr. E. H. Hewins, of Boston. The writer, after characterizing the stream as a very dangerous one, and describing the bridge as built on the general plan known as the Pratt truss, of wrought iron (except the necessary connecting and joint blocks, which are of cast iron), with pin and screw connections, takes occasion to say that it would have been practically impossible, except at an enormous expense, to erect this bridge at this season of the year, had it been built on the lattice or plate-girder system. Having been more or less actively engaged for the last fifteen years in designing and erecting lattice and plate-girder bridges, and having some knowledge, from experience and observation, of the erection of bridges with pin connections, I think I may be allowed to express an opinion upon the subject, and have no hesitation in saying that a lattice bridge designed in accordance with my practice could have been put up on the site of the Waterbury bridge, with as little danger, and at as small a cost, as the one built there by Mr. Hewins. Twenty working hours are enough to secure a single-track lattice bridge of 140 feet span, after the completion of the false work to the bottom of the bridge, which I apprehend is not much more time than is necessary for the erection of the upper scaffolding and securing in place a like bridge with pin connections. A lattice bridge requires no scaffolding, or rather carries its own scaffolding above the lower chord. Nor would a longer time have been necessary to complete the Waterbury bridge than appears to have been occupied by Mr. Hewins, had it been constructed on the lattice plan; and this is only saying that what has been done may be done again.

Mention is also made of the fact that the Waterbury bridge was erected without delaying a train more than a few minutes. Although having no bearing upon the question of relative merits of the two systems of bridge building, but as an example of good management in the erection of bridges, I will state that the old Hudson River Bridge at Albany, consisting of four spans of 178 feet each, one span of 77 feet, thirteen spans of 72 feet each, and a pivot draw of 262½ feet long, was recently rebuilt in iron on the lattice plan from my designs, and although constantly in use by all the passenger trains of the New York Central & Hudson River, and the Boston & Albany railroads, running to Albany, during the entire work of removing the old timber bridge and rebuilding the new iron one (except the draw, which was necessarily constructed open), making not less than fifty crossings each day, except Sundays, there was absolutely no interruption to the regular passage of any train. This bridge was manufactured by Thomas Leighton, of Rochester, N. Y., and erected by Leighton & Hilt, subcontractors.

CHAR. HILTON.

ALBANY, N. Y., February 16, 1874.

#### Steel and Iron Rails.

The following circular has been issued by a Special Committee of the American Society of Civil Engineers:

DEAR SIR: At a meeting of the American Society of Civil Engineers, held January 8, 1873, a Committee was appointed upon motion of Mr. M. N. Forney, of New York, to make an investigation by means of a circular of inquiry, and by such other methods as the Committee might choose to adopt, in order to determine the following points:

I. The best form of standard rail sections for the railroads of this country.

II. The proportion which the weight of rails should bear to the maximum loads carried on a single pair of wheels of locomotives or cars.

III. The best methods of manufacturing and testing rails.

IV. The endurance, or as it is called, the "life" of rails.

V. The causes of the breaking of rails in use, and the most effective way of preventing it.

At the annual Convention, held in Louisville, May 21 and 22, last, the Committee reported progress. The time for making the final report was extended to that of the annual Convention, to be held in 1874, and General I. M. St. John, of Louisville, Ky., was appointed to fill a vacancy in the Committee.

Upon motion of Mr. W. P. Shinn, of Pittsburgh, Pa., it was resolved, that the Committee appointed on January 8, 1873, to investigate questions of form, manufacture, tests, life, and cause of breakage of railway bars, etc., be requested to include in their investigations the subject of the experience of the railways of this country in the use of steel rails, so as to furnish some authoritative data from which parties interested may determine the relative economy of steel and iron rails.

The Committee hope for your aid in eliciting information upon a subject of such a general and great interest to all the railroads of this country, and for this purpose a schedule of interrogatories is herewith enclosed with the request that you will fill in the answers and return it to the Committee by the 1st day of April, 1874. If all the information desired cannot be obtained within the time specified, please answer such questions as you can, and note upon the blank whether you

are likely to be able to answer the others at some future time. A number of copies of the blank are enclosed, so that several reports may be returned, should your experience extend over a number of different roads or parts of roads, as well as to assist in obtaining the desired information from different departments or persons, or upon which to make future returns, should the Committee not succeed at this time in obtaining sufficient information to make a full report to the Society.

The interrogatories are divided into two parts. 1st. Data; 2d. Opinions and Conclusions, so as to elicit both specific and general experience. It may well be that parties having no data at hand, will be enabled nevertheless to send very valuable suggestions. The returns are therefore separated, so that either or both may be used.

The Committee will take great pleasure in forwarding a number of copies of their reports to all parties who may furnish information thereon.

Communications should be addressed to M. N. Forney, Secretary, No. 73 Broadway, Room 131, New York City.

ASHBEL WELCH.  
M. N. FORNEY.  
O. CHANUTE.  
I. M. ST. JOHN. Committee.

#### CIRCULAR OF INQUIRY.

*Interrogatories and replies in regard to form, weight, mode of manufacture, endurance, and causes of breaking of rails, and comparison of steel with iron rails.*

#### DATA:

1st. Name of road.  
2d. Length of track now in use—double track reduced to equivalent single track, — miles.

3d. Over what space of time does experience on this line extend?

ANSWER: From 18— to 18—. Oldest track laid in 18—. Newest track opened in 18—. Most of the line has been in use — years.

4th. What are the forms and weights of the steel and iron rails now in use?

Please send a full-sized drawing of each section if possible, and note thereon: 1—Descriptive number; 2—material, whether steel or iron; 3—date laid in track; 4—name of road; 5—weight per yard; 6—place and date of manufacture; 7—general capacity for wear; 8—characteristic mode of failure; 9—any special observations which may occur to you. It would be

proximately at least) the number of trains and their weight, including that of engines and cars, which have been carried by each section showing satisfactory results, and the condition of the same, after withstanding this traffic.

12th. Character of traffic over the above.

[The form for answer has columns for number of section, number of years in use, annual number of passenger trains, their average weight in tons, annual number of freight trains, their average weight in tons, gross tonnage carried by rail, the percentage of rails which have failed, and "remarks;" and this is to be given for both steel and iron.]

13th. What is the average number of tons of rails requiring renewal per year for each mile of single track or its equivalent?

14th. What has been the experience with re-rolled rails, including steel-topped, silicon steel or others?

15th. Please state the number of miles of track laid with steel rails.

[The form for answer has columns for the number of miles, number of section, weight per yard, and for 10 per cent. worn out, 20 per cent. worn out, half worn out, and probable wear in gross tons, and the information is to be given separately for the rails laid before 1868 and those laid each year thereafter.]

16th. How many of the above steel rails have failed, and how long did they last?

[The form for answer has columns for number of rails broken, and number of rails worn out, and lasted, to be given separately as in the previous question for the rails laid before 1868, and those laid each year thereafter.]

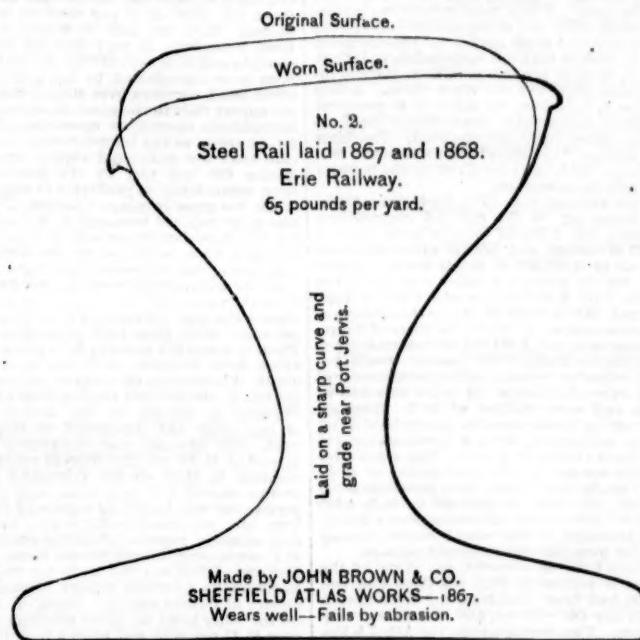
17th. How many steel and how many iron rails have broken during the years 1871, 1872, 1873, and what was the weight per yard of those broken?

[The time of year of breaking is called for by a column in the form for answer.]

18th. Have you observed any relation between the weight of rails and the number broken? If you can do so, give in the following table the number broken of different weights. [This table calls for the number of each kind of steel and of each kind of iron rails broken for each weight of pattern.]

19th. What was the temperature before and at the time of the greater number of these breakages, and what seemed to be the connection between them?

20th. Did the rails begin to break as soon as laid in the track, or were they run over for some time before they began



very desirable, where practicable, to have the pattern show both the original form, and that assumed under wear. We enclose as an illustration, a pattern showing the wear of a steel rail laid on a sharp curve and grade on the Erie Railway.

Please send, also, if deemed desirable, a descriptive list referring to these rails by number, and giving particulars which may seem of interest.

5th. What are the maximum weights per wheel of the passenger and freight engines in common use on road?

[The form for answer has columns for diameter and stroke of cylinder, number of drivers, weight on drivers, weight per wheel and "remarks" for heaviest passenger engines and heaviest freight engines.]

It is suggested that the readiest way of answering this question will be to send a printed copy of the usual locomotive statements, if they give particulars of the dimensions and weights of each engine on the road, and their performances. Please note thereon any peculiarity which you deem that the Committee should take into account, and send, if possible, drawings or paper templates showing the form of the tread of locomotive tires and car wheels which have been worn out in running over the above rails.

6th. What are the weights per wheel of the cars in use?

[The form for answer has columns for weight in pounds of car, of load, of car and load, number of wheels, weight per wheel, distances between centres of wheels, distance between centre-pins of trucks, for the following kinds of cars: baggage, express, mail, passenger, sleeping, box freight, flat and gondola, coal or ore.]

7th. Please state any peculiarities of the road, such as gradients, curves, character of traffic, speeds adopted, etc., etc., affecting the wear of the above rails?

8th. Which form of the above rails have proved most unsatisfactory in use, and why?

9th. Which form and weight do you now adopt as standard for steel rails, and which for iron rails, and why?

10th. Which forms of rails in use on your road have thus far given the most satisfactory results? Please give particulars of each.

11th. Please give particulars of the character of the roadbed on which these results have been accomplished.

[The form for answer has columns for number of section, mode of joint fastening, number of ties per mile, length of tie, width of tie, character of ballast, depth of ballast, radius of curves, and gradients, in feet per mile; and the information under each head is to be given for both steel and iron rails.]

Inasmuch as it will be necessary in order to obtain comparative results, to adopt a common standard of comparison, and as the only one which can be adopted is that of the gross number of tons (2,000 lbs.) which have passed over the rails, it is hoped that some little pains will be taken to ascertain (ap-

to break? Please give separate statements for steel and for iron rails.

21st. Was there any uniformity in the place or mode of breakage of the steel rails, such as at the bolt-holes or slots, or any apparent cause for the particular rails breaking?

22d. What are the peculiarities connected with the breaking of iron rails on your road?

23d. What tests are adopted for steel and iron rails before they are laid in your road?

24th. What is the average cost per mile of replacing rails, exclusive of the cost of the rails themselves, but including taking up the old and putting down the new, and all other expenses, such as handling and train service and freight.

#### OPINIONS AND CONCLUSIONS.

1st. What do you consider the best form of rail section in steel, and what in iron, for your present traffic, or under some circumstances to be stated by you?

2d. Is there any relation or proportion which the weight of the rail should bear to the maximum load borne by one pair of wheels passing over it? Please state separately for steel and for iron.

23d. Would you suggest any different rule in proportioning rails for particular classes of traffic than the above, and why?

4th. What do you consider to be the average life of your best iron and steel rails?

ANSWER: Iron rails, . . . . . years . . . . . gross loads in tons of 2,000 lbs.

Steel rails, . . . . . years . . . . . gross loads in tons of 2,000 lbs.

5th. What is the best method known to you of manufacturing rails?

6th. What method of re-rolling has given the most satisfactory results?

7th. What mode would you favor of disposing of the old rails of iron or steel?

8th. Do you consider the present method of testing rails satisfactory, or what other would you suggest?

9th. What circumstances conduce to breakage of steel and of iron rails, or what parts of the rails are most subject to breakage, and why?

10th. What, in your judgment, are the best precautions to take, in order to prevent breakage of rails?

Please give any other items of information or opinions bearing upon the above subjects which may occur to you.

Signature . . . . .

As it will probably occur that some who receive the above circular may have the requisite data to answer some of the questions and not others—therefore the Committee will state that they will be glad to receive answers on other information relating to any one or more of the questions, if persons receiving the circular are not prepared to reply to all.

You will confer a great favor by returning an answer before the 1st of April, 1874, addressed to M. N. FORNEY, Secretary of Committee, No. 73 Broadway, N. Y.

## Massachusetts Railroads in 1873.

The first part of the Massachusetts Railroad Commissioners' Report gives the following description of the railroads of the State and of the results of their operations during the year ending with September, 1873:

The past year has been one of unprecedented activity in railroad construction in this Commonwealth. Since the first railroad was built in the State in 1835 the average number of miles annually opened for public use has been about fifty. Since the last report of this Board a total length of 130.75 miles of road have been either put into actual operation or substantially completed.\*

In addition to the foregoing a large amount of work has been done upon the Massachusetts Central Railroad between Weston and Northampton, a distance of ninety-three miles, and involving a total expenditure of \$2,600,000; and its construction is so far advanced that the Chief-Engineer reports that, with four months of active prosecution, it could be opened throughout its whole length. The grading of the Lee & Hudson Railroad from Lee to West Stockbridge is also well advanced, and a good amount of work has been done upon the Lee & New Haven road from Lee towards the state line of Connecticut at Colebrook. The financial panic in the country has caused the suspension of work upon the two first-named roads, and other causes have temporarily delayed the prosecution of the latter enterprise. Nearly all of the older roads in the State have made material improvements in their permanent way, station buildings, rolling stock.

Although the opening of the new and the operation of the older roads possess much general and great local interest, by far the most important and interesting railroad event of the year is the completion of the Hoosac Tunnel. A very considerable amount of work remains to be done in enlarging the excavations, but the substantial completion of this great enterprise, after the lapse of nearly a quarter of a century, a period filled with vexatious delays and embarrassments of every kind, is an accomplished fact, and its full completion may be confidently expected by the middle of the coming year. The question as to what shall be done with it, and the roads on either side of it belonging to the State, amounting in the aggregate to upwards of forty miles, will prove, beyond a doubt, the railroad problem of the year. If this great enterprise, involving 25 years of continuous effort and an expenditure of millions of money, was worthy of even a small part of the consideration it has received, it is evident that the approaches to it from either side must prove, in their present condition, entirely inadequate for the business likely to come upon them. Action in this respect has already been too long delayed; to postpone it further must seriously compromise the future of the Tunnel line. This may be looked upon as completed. The blast required to connect the last "headings" was fired on the 29th of November, and July 4, 1874, has been fixed for the passage of the first train through the mountain.

At the close of the last railroad year (30th September, 1873), the entire mileage belonging to the railroad corporations reporting to this Board was 2,364.927 miles of main line and branches, with 614.937 of sidings and 606.728 miles of double track, equivalent in all to 3,586.592 of single track. Of this apparent increase of 343.175 miles, 143 miles was due to the consolidation of the Hartford & New Haven with the New York & New Haven roads, and the Boston & Maine Company reported 56 miles of newly constructed road in the State of Maine. Of the aggregate amount reported, 1,734.955 miles of main track and branches were within the limits of the Commonwealth, being an increase over the number reported in the previous year of 77.085 miles. Of this increased amount 30 miles were due to errors in the returns and computations of 1872. Forty-six miles of road were built in Massachusetts, chiefly by the Old Colony (16 miles), the Springfield, Athol & Northeastern (16 miles), and the Middlesex Central (8 miles). The remainder of the increased amount was due to the construction of additional sidings, freight tracks, &c. There is in Massachusetts, therefore, at this time, one mile of railroad to each 4.519 square miles of territory, and to every 879 inhabitants; the increase of the latter, according to the recent census, having kept exact pace with the increase of the railroad mileage.

Returns were received from 60 corporations. Two of the corporations which made returns in 1872, the Cape Cod and the Stoughton Branch, had been dissolved, the first having been consolidated with the Old Colony, and the latter with the Boston & Providence. Two corporations, the Athol & Enfield, and the Hartford & New Haven, made their returns for the present year under the names of the Springfield, Athol & North-Eastern, and the New York, New Haven & Hartford. Five new corporations, the Lee & New Haven, the Lowell & Andover, the Middlesex Central, the New Bedford and the Worcester & Shrewsbury, and one old corporation accidentally omitted, have been added to those contained in the last report. Two only of these corporations, the Lowell & Andover and the Worcester & Shrewsbury, were organized under the general law of 1872, the latter being a narrow-gauge (3 feet) road. Apparently each company making returns of length owned upon an average 45 miles of road, the amounts of which varied from 0.66 mile in the case of the Horn Pond Branch to 257 miles in that of the Old Colony. In reality, however, the system is divided among some 31 distinct boards of direction, controlling an average of 76 miles of road each, but varying in amount from the Old Colony, which controls 257 miles, to the Providence, Warren & Bristol, which returns 5.79 miles. The average cost of roads has been \$83,294.88 per mile, exclusive of equipment, which has amounted to the additional sum per mile of \$7,578.45. The cost per mile on account of road varies from \$88,887.82 in the case of the New York, New Haven & Hartford, to \$15,817.71, in that of the Middleborough & Taunton; the cost of equipment varies from \$816.96, in the case of the Springfield, Athol & Northeastern to \$18,846.96 in that of the Eastern. The average cost per mile of an equipped road is \$64,676. The entire amount directly invested in the railroads reporting to this Board is \$157,609,788.33, represented by \$115,406,884.54 of stock, \$36,606,894.67 of debt and \$5,596,005.12 of surplus.

Of the 61 corporations making returns, 28 paid dividends, ranging from 1 to 10 per cent., and averaging on the entire capital of all the roads represented by stock \$34.100 per cent. Eight corporations divided 10 per cent., one divided 9 per cent., four divided 8 per cent., three divided 7 per cent., six divided 6 per cent., six divided less than 6 per cent., and thirty-two made no dividends. The gross income of the roads during the year was 22.16-100 per cent. of their entire cost, but the cost of operation was 72.7 per cent. of their gross earnings, leaving an average net income from the year's doings of 6.4-100 per cent. on the investment. The capital stock of these corporations appears to be owned by about 32,921 persons, the average amount held by each of whom is \$3,506; of the whole number of stockholders 72 per cent. are residents of Massachusetts, controlling 54 per cent. of the entire capital stock, or an aggregate of \$69,267,080. The total earnings returned for the year are \$34,930,527.42, being an increase of \$4,051,984.78 over the previous year on 311 miles more of road, of which increase \$2,424,213.92 was derived from the passenger business, \$1,072,024.26 from freight, and the remainder from miscellaneous sources.

Surprise is often expressed at the constant increase of the capital accounts of railroad corporations, and doubts are entertained as to whether the increased investment is warranted. Upon this point the results to be deduced from the returns for the present year are suggestive. The investment in railroad property included in the returns for 1873 is over \$21,000,000 more than that included in the returns for 1872. The receipts of 1873 are, however, over \$4,000,000 more than those of 1872, indicating gross earnings of 19 per cent. per annum on the additional investment, of which \$942,173, or more than 4 per cent. on the increase, was net profit. This, however, included the returns of the New York & New Haven road, an old and very wealthy company, the incorporation of the receipts of which into the aggregate might produce most deceptive results. Taking seven of the eight Boston roads (excluding the Boston, Hartford & Erie) it will be found that they have augmented their investment during the past year by over \$9,000,000, but they have also increased their gross receipts by over \$1,800,000, showing an average of 19 per cent. increased earnings on the additional capital invested.\* The operating expenses have, however, also been largely increased. The net receipts of these roads consequently showed only an increase for 1873 of \$235,712.69 over those for 1872, or 2 per cent. on the \$9,794,000 of increased capital. It is not safe to draw any positive inferences from these statistics. It may well be that the increase both in receipts and in net profits was derived from sources which had been in no way affected by the additional capital; or, on the other hand, earnings from the increased development may not yet appear fully in the receipts, or may have been eaten up by unprofitable operations upon the older parts of the line. So far, however, as any inferences can be drawn, they would indicate that the additional capital invested in their business during the last year by the Boston corporations has not been immediately so profitable as might have been anticipated. While the gross earnings constituted last year 22 per cent. on the entire railroad investment, the additional gross earnings for 1873 were but 19 per cent. on the increase in the amount invested, upon which again the difference between the net earnings of the two years represent a profit of only 4 per cent.

Of the entire gross receipts, about 47 per cent. were derived from the passenger business and 49 per cent. from freight, and during the year the receipts from freights had increased but 7 per cent., while those from passengers increased 18 per cent. Upon 19 roads the receipts from passengers were in excess of those from freights, while the reverse was the case on 12 roads. The average earnings on each mile of road operated was \$14,820.37, the amount varying from \$2,062 on the Duxbury & Cohasset to \$36,522 on the Boston & Albany. The cost of operation has amounted to \$10,782.13 to each mile of road. The average cost of running a train one mile was returned at \$1.26, varying from 98 cents on the Boston, Barre & Gardner to \$1.89 on the Vermont & Massachusetts. Of this average stated cost per train mile of \$1.26, maintenance of permanent way, including repairs of road, buildings, bridges, iron, etc., amounted to 22.9 cents; traffic expenses, including fuel, salaries, repairs of rolling-stock, oil and waste, etc., to 91.7 cents, and miscellaneous items amounted to 2.1 cents. The cost of fuel was 18.3 cents per train mile, repairs of locomotives were 8.8 cents, repairs of passenger cars 10.3 cents, repairs of freight cars 15.1 cents, oil and waste was 1.8 cents. On the other hand the gross earnings on each passenger train were \$1.77 per mile, and upon a freight train \$1.75; while the average gross income on each train (including construction and other trains) was \$1.74 per mile, and the net earnings were 47.5 cents.

There are few questions connected with the economy of railroad operations in regard to which it is more desirable to reach some reliable conclusions than as to the proportion which the weight of rolling stock bears to the number of passengers, or the tons of freight carried. The average number of passengers to each train during the last year was 71, and the average number of tons of freight was 64. According to the returns for the last year, it would seem that for each passenger they carry the Massachusetts corporations have to move 1.70 tons in rolling stock, and for each ton of freight over 2.9 tons of rolling stock. The average price charged and received for each ton of material moved is, therefore, as nearly as possible, one cent per mile. The returns both for the last year and the year previous would seem to indicate that some three tons of machinery are moved on our railroads to each ton of merchandise. Considerable doubt must, however, exist as to the substantial accuracy of these averages in view of the fact that such roads as the Boston & Lowell, the Boston & Maine and the Old Colony claim to move between 1.90 and 2 tons only to each freight car they run, or an average of less than 50 tons to a train of 25 cars.

The total mileage of passenger trains run during the present railroad year exceeded those of the last by 1,498,779 miles, and the number of passengers carried was 6,388,398 greater; as regards freight, the train mileage increased 1,274,845, and the number of tons carried 958,638. The average fare charged per mile on all the roads was 2.49 cents, ranging from 6 mills per mile for season-ticket passengers for long distances, to 10 cents per mile for single-trip passengers for short distances. Upon freights no general average can be named, but these have ranged from 1.01 cents for through freights for long distances, to \$1.00 per ton per mile on short

local freights. These charges, however, include the cost of handling in each case; the average charge for hauling each ton of freight one mile has been 2.18 cents. The enlarged volume of Western produce seeking shipment to Europe by way of Boston, noticed in the previous report, is also apparent in the present one.

As regards equipment, it appears that 630 miles out of 3,579, or a fraction less than 18 per cent., have been laid in steel. In this important respect the New York, New Haven & Hartford is in advance of all other corporations, its entire main line being practically laid in steel, of which it reports 237 miles on an entire length (double track) of 128 miles. The Boston & Albany reports 174 miles of steel, laid on a double track main line of 200 miles, being considerably less than one-half. Of the remaining roads the most noticeable in this respect is, perhaps, the New Haven & Northampton, which reports 23 miles; the Connecticut River, the Boston & Providence, the Eastern and the Boston & Maine, each report between 25 and 50 miles, or an aggregate increase of 57 miles during the last year as compared with a total length of 98 miles at the beginning of the year. It is a fact worthy of notice that over 37 per cent. of the entire mileage laid in steel, reported to this Board, is upon one road, the New York, New Haven & Hart-

ford. The number of telegraph stations returned is 325, being on an average scarcely one station to every eleven miles of road. The increase of rolling stock during the year has again been very decided; that of locomotives being from 808 to 908, or 12 per cent.; that of passenger cars being from 1,015 to 1,243 or 22 per cent. increase to 23 per cent. in passengers carried one mile; that of freight cars has been from 14,579 to 16,143, or 11 per cent. increase to 9 per cent. in increase in number of tons of freight carried one mile. The process of equipping locomotives and cars with train-brakes has proceeded with commendable rapidity. Previous to the Revere disaster in August, 1871, the train-brake was in use only on a single road in Massachusetts; at the close of the present year it had been applied to 194 locomotives, and 709 out of 1,243 passenger cars. Either the Westinghouse air brake or the Smith vacuum brake has now been adopted and is in use on each road running out of Boston, with the exception of the Boston, Hartford & Erie. The New York, New Haven & Hartford has the Westinghouse brake on 50 of its locomotives and all of its passenger cars; the Connecticut River has adopted the Smith vacuum brake and has applied it to 3 locomotives and to 8 out of 25 cars; of the remaining roads the Nashua & Lowell and the New Haven & Northampton alone have made any considerable progress in this respect. The roads indicated in the last reports as peculiarly backward in adopting this improvement are the Boston, Clinton & Fitchburg, the Vermont & Massachusetts and the Providence & Worcester; of these it is understood that the two first are anxious to equip their rolling-stock with these brakes as soon as an understanding can be arrived at with connecting roads as to which is the best appliance. The Miller platform, also, which as a precaution against danger in case of accident is hardly of less importance than the train-brake, is also growing into general use; it has been adopted by 14 corporations and applied to 791 cars. Of the Boston corporations all have availed themselves of it except the Boston, Hartford & Erie, the Old Colony and the Boston & Lowell. There are 1,002 stations on the roads making returns, or, upon an average, a station to every 2.35 miles operated; but within the limits of Massachusetts the proportion is somewhat less, there being a station to each 2.41 miles. As regards crossings of railroads at grade, it appears that out of 3,241 existing crossings, 2,443 are at grade, and of this number 446 only, or but 14 per cent., are protected by gates or flagmen. Of the whole number of overhead bridges, 117 or 12 more than last year, are 18 feet or more above the track. There have been three additions to the number of grade crossings of one railroad by another during the year, and two more have been applied for and refused by the Commissioners. The whole number of these crossings in the State is now 40, and the roads are carried over and under each other in 8 instances only.

## Railroad Evolution.

Among the few annual official reports which are received by the public with marked attention and interest, that of the Massachusetts Railroad Commissioners holds a high place. It is always well written, always the result of thought, and always contributes valuable material to the study of the railroad problem. For these reasons, we have looked with interest for the report of the current year, to see what the Massachusetts Commissioners have to say on those questions of transportation which, for the past few months, have caused so much turmoil and confusion in the West. We find that in general the Commissioners do not differ very much in opinion as to the practical results obtained by the passage of the Illinois laws of 1871 and 1873 from the rest of the world; they believe that these laws thus far have had very little good effect. They say that the law of 1873, which put the tariff in the hands of the Railroad Commission of that State, was "nothing less than a sweeping away of the entire basis upon which not only their railroad system had been built up and their transportation carried on, but even that upon which population had distributed itself in their State." The intention of the law was that after a certain date competition was to cease, and absolute justice under State supervision begin in its place. But competition had been at work for thirty years, building up favored points of settlement, neglecting others, until the population had distributed itself, and business arranged itself in accordance with the system of "free railroad construction." All this was to be changed in a night; there was to be no more competition, no more favored points, but the system was to be managed as if from the very beginning it had been the exact opposite of what it really was. "This complete ignoring of all but one class of existing facts has frequently been noticed in the legislation of other States as well as of Illinois. But it may fairly be doubted whether it has ever advanced the prospects of any desired reform."

If the experiment of railroad reform in Illinois has failed, we have still before us the question, What is the solution of the railroad problem? The Massachusetts Commissioners give a very remarkable answer to this question, which, that we may do them no injustice, we give in their own words:

"As yet, human ingenuity has devised but four methods of establishing the relations in which the railroads of any country shall stand towards its government. Left wholly in the hands of private individuals or of corporations, they may be independent of all government control, standing on the same footing as cotton-mills or iron-foundries; or they may be subjected to the operation of special municipal laws establishing their obligations, regulating their charges, and limiting their profits; or, still remaining the property and under the control of private parties, they may be subjected to an executive supervision and control; or, finally, in whole or in part, they may be owned and operated by the State. In fact, a species of natural law now begins to be formulated. In all countries the political systems of which are based upon the principle of non-interference in industrial enterprises, railroads are first organized on the theory of their sufficient regulation by natural laws. From this incipient stage they develop through an attempted regulation by legislative enactment into a state of practical executive supervision; the whole process tending, with a greater or less degree of friction, towards the final result, in which the work of transportation by rail must apparently be recognized as one of the functions of government. This process of evolution may now be studied in different civilized countries in each of its several stages. In certain parts of America non-interference is developing into an

Miles.	
The Old Colony Railroad extension from Wellfleet to Province-town.	14
The Old Colony, Shawmut branch.	2%
Eastern Railroad, Swampscott and Marblehead branch.	4
Boston & Lowell, "Middlesex Central," Concord to Lexington.	8
Nashua, Acton & Boston Railroad, from Acton to State Line.	15
Ashburnham Railroad, from Ashburnham to Ashburnham Centre.	2%
Ware River Railroad, Gilbertsville to Winchendon.	33%
Springfield, Athol & North-Eastern Railroad, Barrett's to Springfield.	17
Hopkinton Railroad, from Ashland to Milford.	11½
Worcester & Shrewsbury, from Worcester to Lake Quinsigamond.	11½
New Bedford, from New Bedford to wharf.	1%
Making a total length of roads opened.	1,121½
In addition to the above the Boston, Barre & Gardner Railroad, from Gardner to Winchendon, a distance of.	10½
The Lancaster Railroad, from South Lancaster station on the Worcester & Nashua Railroad, to Hudson on the Marlboro' branch of the Fitchburg Railroad, a distance of.	8
which have been substantially completed, with the exception of ballast-lying the track.	
Total length.	1,303½

INVESTMENTS AND EARNINGS.					
	Increased in investment of 1873 over 1872.	Gain in gross receipts in 1873 over 1872.	Per cent.	Gain in net receipts in 1873 over 1872.	Per cent.
Boston & Alb'y.	\$2,125,688.49	\$547,472.30	26	-\$116,703.21	-25
Boston & Lowell	583,339.92	170,972.10	29	146,099.98	25
Boston & Maine,	2,278,935.00	263,951.49	11	176,449.55	9
Boston & Prov.	707,411.88	105,708.76	15	-37,004.22	-5
Eastern	1,570,192.38	266,216.45	18	-31,000.49	-5
Fitchburg.	95,171.50	49,023.40	52	16,143.78	17
Old Colony	2,438,929.51	479,818.73	19	81,789.25	9
Total	\$9,794,559.56	\$1,863,158.31	10	\$235,715.68	2
All roads in the State	\$21,726,412.92	\$4,051,984.72	19	\$942,173.12	04

attempt at legislative regulation; in other parts of the country and in England legislative regulation is passing gradually into the phase of executive supervision, which may be studied in France as a perfected system approximating to State ownership; which final condition, again, is in its turn matter of warm discussion both in America and in England, while in Belgium it is already in full development. The gradual and inevitable evolution in this process of development has perhaps been more clearly illustrated in the experience of America than in that of any other single country."

"In this country the relations of the railroad system to the political system may be considered as having now passed through two phases of discussion and attempted settlement—corresponding to two stages in the process of evolution—and to be entering upon a third. It has passed through the non-interference phase and the legislative phase. During the last year it has, in the State of Illinois, entered upon what may be called the phase of executive supervision; while in Massachusetts the discussion has advanced yet further, and has fairly touched its utmost possible limit in the agitation of measures looking to partial State ownership."

There is undoubtedly a great deal of attractiveness about this answer. It is simple, it embraces and explains all the facts, and it does so in a way that takes into account what is commonly known as progress, while it is no less adapted to tickle the fancy of a vast multitude of loose reasoners who, having a vague feeling that Evolution, Natural Selection, and the Survival of the Fittest are ideas very much "in the air," and that in order to keep up with the times it is necessary to explain as much of life as possible by them, jump eagerly at any conclusion in law, religion, morals or politics which is offered them as that to which Evolution points.

Nevertheless, we fear it will be found that the reasoning out of which this natural law of railroad evolution has been evolved is wholly fallacious, and that there is really no such law at all. In the first place, it would be a somewhat dangerous process to infer from the fact that we may find in different countries the same social function performed in different ways, that therefore there is a law of social progress by which the methods are related to one another in the way of stages in the general path of progress. In this country the mayors of cities are local officers elected by the inhabitants; in France they are officers appointed directly by the central Government at Paris.

Is it to be supposed these are indications of some law of social evolution which has any practical bearing on the present condition of Washington, now under the control of a "Governor" and a Board of Public Works? Again, in England and America the press is free, and any one who is able to establish a newspaper may do so; in France the press is under constant supervision exercised by the Central Government; while in Germany the supply of the press with all kinds of valuable information, as well as leading articles, is in the hands of a sort of government bureau. Do these facts point to a general law of journalistic evolution, of which the first stage is to be seen in operation in America and England, the second in France, the third in Germany, all three pointing to a fourth, in which regulation and supervision shall be replaced by actual State appropriation and management? This certainly is not the kind of evolution which the advocates of liberty of the press have generally had in their mind in discussions of the subject. The business of banking, too, is very differently managed in different countries. In some countries it is closely connected with the government; in others it is left free, under certain necessary restrictions, to the public at large. In this country, for the last few years, there has been an apparent tendency towards centralizing the business in the hands of banks so intimately connected with the Treasury at Washington as to be in great measure dependent upon it; but we have yet to hear of any one who is willing to maintain that there is a general law of banking evolution by which "free banks" gradually, logically and inevitably pass into the hands of the central Government.

But we may go further than this, and inquire whether the Massachusetts Commissioners' law of railroad evolution will not work one way as well as another. Railroads have only been in existence for forty years, and in that time human ingenuity has devised but four methods of establishing the relation in which the railroads of any country shall stand towards its government. They may be owned and operated by the government—this is the first stage—as in certain European countries; or they may, in the second stage, be subject to executive supervision and control, as in Illinois; or they may, in the third stage, be subjected to special legislative regulation, as in most of the United States; or they may, in the fourth, be independent of government control, except, of course, such as is necessary from the very fact that railroad corporations are artificial creations of municipal law. Of course, all evolutionists, whether in botany or railroads, are aware that evolution is not altogether a question of priority of time. The same stage does not appear simultaneously in different countries, and we cannot absolutely infer that state management and control is the last stage because the farmers of Illinois seem, after forty years of experiment, to be moving in that direction, any more than we can make the opposite inference that state management and control is the first stage because it came in with the introduction of railroads in various Continental countries.

In fact, this law of evolution seems to be a pure assumption. There is no proof of it, and the argument really consists in enumerating the different systems of railroad management now in existence in communities widely separated by diversity of law, language, religion, and manners, and imagining a plausible connection between them of a certain kind. There are no doubt a great many institutions of society which have passed through various stages from that of individual management to that of government control, but it certainly does not follow that all must; and, considering the extremely short space of time which has elapsed since the application of steam to locomotion, we may well hesitate before handing over all the railroad, steamboat, and canal lines to the Government, National or State, on the strength of a law which may be evolved by ingenious juxtapositions of the system in vogue, and which may be worked backward almost as well as forward.

The fact is that the railroad problem is a practical question—as, indeed, the Massachusetts Commissioners seem, in particular cases, to be willing to admit; and the idea that it can be settled by such very general theoretic considerations as those we have been here considering, is to confuse the whole subject. The question into whose hands shall the construction of railroads be given, and by whom shall their management be regulated, is a question which depends so much on the habits and traditions of the people for whom the railroads are to be built, that any general law which treats all communities as on an equality in this respect is fallacious. If we are to believe that evolution points to such disorganization of business as the recent Illinois railroad laws have produced, all we can say is, so much the worse for evolution.

But besides this, there is a serious defect in the cardinal assumption on which all the reasoning of the Massachusetts Commissioners rests—the assumption that there is any such thing as a railroad free from Government control. Their law evolves State-owned railroads from railroads absolutely independent of Government. But there never have been any of these, even in this country. The most arbitrary corporation that ever blocked freight or butchered passengers is a mere creature of the Government which calls it into being, an artificial body which, even under the decision of the Dartmouth College case, is subject to constant supervision and control. The very fares and freights it collects must be reasonable fares and freights, and the only difference between a tariff under what the Massachusetts Commissioners call a system of free railroad construction and the State-ownership system would be,

that in one case the courts would have jurisdiction over the matter, and in the other case an executive board—one being just as much a part of government machinery as the other. The Commissioners seem to think the rules of the common law for the regulation of carriers are vague; but they do not seem any more difficult of execution on that account than the rules of the Illinois Commissioners have proved on others, or than the rules laid down by some future board of commissioners in whom the entire railroad system of Illinois shall be vested in fee are likely to be. Not only have the courts jurisdiction over the management of the road but the charter itself may be forfeited to the State for abuse or even non-use of privileges, and this very thing has been done within two years in the case of a Massachusetts road chartered to move freight through the streets of Boston. The reason why the almost absolute control over the injustice and malfeasance of corporations given by the law in theory is not carried out in practice, is not because corporate powers are delegated by State to private associations, but because legislatures are corrupt and courts are timid; and what ought to be done in the way of remedy is to make legislatures honest and courts brave. When it is found by experience, as Mr. Adams implies it has been in this country, that neither the legislature nor the courts nor the executive can be trusted to control the management of railroad corporations, why a mere transfer of the ownership of them or some of them to the Government, composed of nothing in the world but legislature, courts and executive, should produce the desired result, we do not understand.

[From the New York Times.]  
The Ghost that Jim Saw.

(KANSAS PACIFIC RAILWAY.)

1873.

"Why, as to that," said the engineer,  
"Ghosts ain't things we are apt to fear,  
Spirits don't fool with levers much,  
And throttle-valves don't take to such;

And as for Jim—

What happened to him  
Was one-half fact and t'other half whim.

Running one night on the line, he saw  
A house as plain as the moral law—  
Just by the moonlit bank, and thence  
Came a drunken man with no more sense

Than to drop on the rail,

Flat as a fai.

As Jim drove by with the midnight mail.

Down went the patents. Steam reversed,  
Too late! for there came a "thud." Jim cursed,  
As his fireman, there in the cab with him,  
Kinder stared in the face of Jim,

And says, "What now?"

Says Jim, "What now!"

I've just run over a man—that's how!"

The fireman stared at Jim. They ran  
Back, but they never found house nor man—  
Nary a shadow within a mile.  
Jim turned pale, but he tried to smile—

Then on he tore,

Ten miles or more,

In quicker time than he'd made afore.

Would you believe it!—the very next night  
Up rose that house in the moonlight white;  
Out comes the chap and drops as before,  
Down goes the brakes, and the rest encore—

And so, in fact,

Each night that act

Occurred, till folks swore Jim was cracked.

Humph! Let me see; it's a year now, most,  
That I met Jim, east, and says, "How's your ghost?"  
"Gone," says Jim; "and more, it's plain  
That ghost don't trouble me again;

I thought I shook

That ghost when I took

A place on an Eastern line—but look:

What should I meet the first trip about,  
But that very house that we talked about.  
And that self-same man! "Well," says I, "I guess  
It's time to stop this yer foolishness."

So I crammed on steam,

When there came a scream

From my fireman—and it broke my dream—

"You've killed somebody!" says I, "Not much;  
I've been that often and that ain't no such,  
Now I'll prove it. Back we ran,  
Aud—darn my skin!—but that was a man

On the rail, dead,

Smashed in the head—

Now I call that meanness!" That's all that Jim said."

BRETT HALSTEAD.

object to the common law, and so long as delays, tariffs, and indemnities are categorically regulated by law. Have we not seen the administration forcing shippers to accept a declaration of irresponsibility so as to escape its obligations? Such a system can be tolerated no longer. Can it be maintained that the State which is favored with a monopoly can escape the obligations which the commercial code imposes on all carriers, and that it must be protected, in defiance of all law, in the errors and faults which it commits?

Transportation in Congress.

In the Senate, on the 18th:

The President pro tem. laid before the Senate resolutions of the Kansas Legislature charging misconduct on the part of the Union Pacific Railroad Company, by reason of alleged discriminations against the Kansas Pacific Railway. Ordered to be printed.

In the House, on the 18th:

Mr. Sawyer, of Wisconsin, asked leave to report, from the Committee on Commerce, a bill to extend until April, 1876, the time for the completion of the Green Bay, Sturgeon Bay and Lake Michigan Ship Canal. Objected to.

Mr. Holman, of Indiana, offered a resolution directing the Secretary of the Treasury to inform the House the amount paid since January, 1866, for the transportation of troops and property of the United States on each of the several railroads that have been constructed in whole or in part by the aid of lands granted by the United States, conditioned that such railroads should be and remain public highways for the use of the Government free of toll and other charges. Adopted.

In the Senate, on the 21st:

Mr. Harvey, of Kansas, presented a resolution of the Kansas Legislature with reference to the charges made by the Union Pacific Company on traffic coming from the Kansas Pacific. Referred to the Committee on Railroads.

In the House on the 20th, having under consideration the affairs of the District of Columbia:

A bill authorizing the Washington City & Point Lookout Railroad Company to extend its line through the city of Washington being opposed by several Pennsylvania members, it was charged that the Pennsylvania Railroad Company was at the bottom of their opposition; and on the other hand it was shown that the Delegate from the District is Vice-President of the company. Pending its consideration the House adjourned.

In the House on the 21st:

The consideration of the bill permitting the Washington City & Point Lookout Railroad to pass through Washington was resumed.

Mr. Negley's motion to lay it on the table was rejected.

Mr. Butler, of Massachusetts, and others, argued that the road might seriously injure the Navy Yard, the National Observatory, and that the bill would permit the building of a depot almost anywhere in the city, and give the company control of the whole river front of the city. The bill was referred to the Committee of the Whole.

An impression seemed to prevail that the bill was intended to enable the Baltimore & Ohio Company to secure better terminal facilities in Washington.

THE SCRAP HEAP.

Trial of the Loughridge Air Brake.

A trial of this brake was had on the Baltimore & Ohio Road between Annapolis Junction and Baltimore, February 19, the results of which are thus reported by the Baltimore Sun: "While the train was running at the rate of 45 miles per hour the brakes were applied, and in twenty seconds of time the cars were at a dead halt on the tracks, having in that time advanced but 548 feet. While running at the rate of thirty miles per hour the train was halted in sixteen seconds, having in that time advanced 411 feet. The last test made was while the train was moving at the rate of 45 miles per hour, and in twenty-two seconds the cars were at a stand still, having gone forward but 685 feet after the brakes had been applied. The stoppage of the cars was not attended with those sudden jerks accompanying the sudden braking up of cars supplied with hand brakes, but the train came to a stand still as though there had been but one car attached to the locomotive."

Examination of Railroad Questions in Germany.

A conference was held recently at Berlin, convoked by the Minister of Commerce, to consider all the various questions connected with the safety of passengers. The co-operation of the directors of the various lines was invited, and a programme (drawn up in advance) shows the general character of the anticipated discussions. The programme embraced thirty-two separate questions, which are divided into four leading categories: 1. Works on the line and at the stations. Under this are included the construction of switches, the means of repairing them, and their maintenance and control. 2. Signal systems, with the view to increased security, particularly stoppage signals in the possible case of interruption of telegraphic communication. 3. Means of control. Here will be considered questions as to brakes, precautions to prevent cars that are stationary from being removed by the wind, the possibility of preventing certain locomotives in fast traveling in express trains, the control of the rate of speed, the nature of the goods, cars, and the avoidance of accidents in coupling. 4. Management. Under this head will specially be considered how far the defective training of the officials is responsible for accidents, and what changes in their education might be adopted; how far the overworking of officials has contributed to accidents, and a number of similar points.

A Sample Dead-Head.

A railroad manager sends to the St. Louis Republican a copy of an application for a pass, which is like this:

The H—, A weekly paper, &c.  
office of the h—  
mo, — 1874.

R. R. Co.,  
Sir We Wish to advertise for yow we have enlarged our paper and to advertise for yow, for A pass.  
I will Incert two Columns in the h— one year for A pass on the Road one year An all so Right up yowre Business indiferent parts of the paper.

If this Will Suit yow Send me acopy. Let me no in Relation to the Matter.  
yours &c  
Address —  
Manager —

The English Iron Market.

*Rydland's Iron Trade Circular* of February 7 says:—"Just at the present time our trade is in a very critical position with regard to its power in holding its position in foreign markets. The continued high rates for coal, coke and pig iron, with the high wages of the men are forcing up the selling price of finished iron in nearly all iron making localities, and this of course gives the iron masters of the Continent a good chance of supplanting us." Then, after giving quotations from Liverpool, Belgium and New York, it adds:—"It will be seen from the above prices that our English iron is considerably higher in price than Belgian, and at the present selling price of finished iron in New York there is no chance whatever for our iron there."



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## Editorial Announcements.

**Addresses.**—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress, and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proportion to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

## WHAT ARE REASONABLE PROFITS?

We read in the resolutions of transportation conventions, the platforms of parties, and the editorials of the newspapers which discuss the transportation question, very generally a statement that railroads should be permitted to return their owners a "reasonable profit" on their investment, but that anything above that is extortion and not to be endured. Granting this, we shall have made a long stride toward establishing definitely the limits to which charges should be kept down if we can ascertain what reasonable profits are. We all know how low the returns of a railroad investment may be—interest at 0 per cent. and the loss of all the principal—but while everybody seems agreed that railroads should not make extortionate profits, they do not even hint what profits are extortionate.

Of course, it cannot be expected that the whole sum invested in a railroad should earn a less rate of interest than that commonly paid for large loans perfectly secured in the country where the railroad lies. That is to say, men cannot be expected to choose railroad rather than other investments unless they can make as much by them. Otherwise, they would let the railroads alone and put their money in those other safe investments which are more profitable.

What is it that governs the reasonableness of the rate of profit on an investment, or, to change the form of the question, what circumstances affect the price at which money is loaned? This chiefly: the degree of certainty that the interest and principal will be promptly paid when due. In the business with many risks, a higher rate is estimated for and aimed at than in the safe and steady business, that the excess of profits of one year may balance the losses of another. And it matters little as to the source of the risk. The man with a bad reputation for honesty pays a very high rate for money, (if he gets it at all), and if he has only a reputation for a want of promptness in meeting engagements, it will add to the interest which will be charged him.

This is all perfectly proper; and, whether it be so or no, the world can get money on no other terms. The safest businesses get capital the cheapest and make the lowest profits; the most hazardous ones pay higher interest, and

must therefore, to succeed, make greater profits, and they feel justified in making very large profits indeed in return for the risks of making very large losses indeed.

Now when we consider railroads as investments, we find an infinite variety of individual cases, of which the average may seem unattainable. But we will simplify the matter greatly if we will leave out those enterprises whose profitability has been fully proved by experience, and remember that every railroad when it is first presented to the attention of investors is a *new* enterprise, whose future has to be estimated and is liable to all the numerous errors of mistakes in estimation and to those others, perhaps quite as formidable, of changes in the circumstances between the time of planning and that of executing the scheme. The question, therefore, is simpler than it looks, and may be stated briefly: How closely can investors estimate the results of the working of a new railroad?

If the exercise of ordinary common sense or the means of information within the reach of investors will enable them to avoid unprofitable schemes and to choose only those which are sure to succeed, then they must be content with something like the rate of interest current for safe investments in the country where the railroad is constructed. But we can judge best of the possibility of this by examining the history of railroad investments, which, imperfect as it is, probably is more complete than that of manufacturing investments, or any other save government loans.

Very interesting and useful indeed would be a complete account of all investments made in railroads from their beginning in any given country or district; but it is doubtless quite impossible to collect all the facts now, and to do so ever so imperfectly would require more labor than we can now devote to it. We can, however, reach something like exactness in the later investments.

After the 1st of January, 1874, there were in this country eighty-eight railroad companies which were in default in their interest payments on the whole or a part of their bonded debt and had not yet been foreclosed, and this does not include subordinate companies consolidated since the issue of their bonds with some other, but simply those companies to whom the bondholder then looked for the payment of his interest. The total amount of the bonds on which default had been made was \$370,360,668, on which the yearly interest is \$14,373,505 currency and \$12,591,712 gold, the whole being equivalent, at the price of gold current on the 1st of January, to \$28,217,388. On one of these issues the first default was in 1868, on another in 1869, on one in 1870, on six in 1871, on 14 in 1872, on 79 in 1873, and on 34 on the 1st of January, 1874, the total number of issues (not companies) in default being 150, so that three-fourths of the whole have become delinquent since 1872, or within a year and a day; but this disproportion is likely to exist under any circumstances, as in the course of two years the bondholders will usually foreclose their mortgages or compound with their debtors.

The mileage covered by these bonds is 12,426, which is just about 17 per cent. of the whole mileage of the country. But if we examine the list of roads carefully we will see that all of them, except perhaps four or five, were constructed after the war; that is, they are new roads, and if we are to consider the proportion of roads in default, we should compare them only with other new roads. Now there has been built in this country since the war about 36,000 miles of new railroad, and therefore we may say that one-third of the railroads built since the war are unable to pay their debts and in such a condition that they are at the mercy of their bondholders, who, if they choose, can take possession of the property and deprive the stockholders of any interest in it. Virtually, whatever stockholders have put into these railroads they have lost. And moreover, the bondholders themselves have suffered a terrible depreciation in the value of their securities, varying from one-third to nine-tenths of the money they invested in them, and probably averaging as much as 40 per cent. But this list does not include all the new issues of bonds on which default has been made, for some—indeed issues to a large amount in the aggregate—have been settled by foreclosure and otherwise.

Now what effect on investors can be expected from this state of things? They are offered railroad bonds bearing 7 or perhaps 8 per cent. interest, but they know by the history of their investments that there is one chance in three that the interest on the bond will not always be paid, and that then the value of the security—the price at which it can be bought and sold—will be not more than half what they give for it. Of course the consideration of this risk, this great risk, leads them to demand a high rate of interest for their money, which is got by a low price for the bonds. Doubtless, if it had been known beforehand that the proportion of failures would be so great, investors would have asked higher prices than they did, for on the whole investments in new railroad bonds have been very disastrous to the investors, very few of the bonds which pay interest regularly being worth as much in the market now as the prices at which they were sold.

If all the railroads built since the war were bonded in the same proportion as the mileage in default, the total

bonded debt of those not in default is about \$700,000,000, and the total bonded debt of all the new railroads more than \$1,050,000,000. The holders paid, probably, about \$900,000,000 for these bonds, \$800,000,000 of it for those which have not yet failed to pay their interest. Now, if we estimate an average depreciation in market price of 10 per cent. on the latter class and 40 per cent. on those in default (which is probably within the truth), we will find that the holders have lost \$60,000,000 on the former and \$120,000,000 on the latter, or \$180,000,000 on a total investment of \$1,050,000,000, which is more than 17 per cent. That is, the investor who has put \$10,000 into new railroad bonds within the last eight years has, on the average, a property which cannot be sold for more than \$8,300 at this time, besides not having always received his interest.

So much for the bondholder; as to the stockholder it is impossible to use any figures, for the reason that we do not know how much they have paid for their stock. Doubtless, on the whole, individual stockholders have paid very little money; but municipalities have invested large amounts, and a very large part of the holdings have been obtained in return for work on contracts as part payment, the cost to the holder being, of course, in proportion to the value of the work not covered by the other pay. But whatever may have been paid for this property, it is plain that the risk of losing it is much greater than in the case of bonds, and it will be found that there are very few stocks of roads built since the war that have any market value.

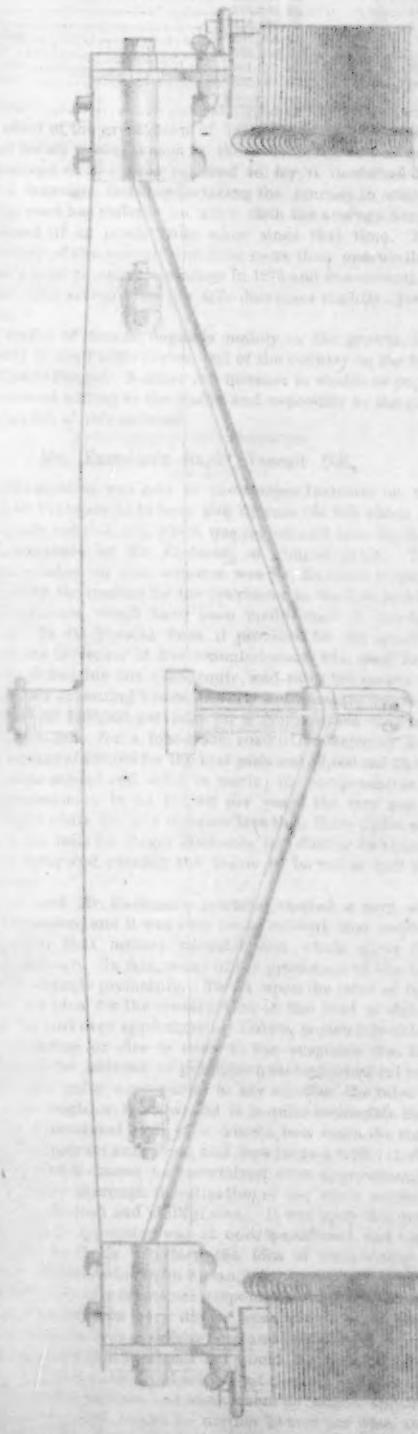
It may be urged that the railroads built since the war are exceptionally unprofitable, and that conclusions drawn from their condition and returns will not apply to the average railroad. We hope that this is true; but without a fuller examination into the history of the older railroad investments we would not venture to say that they have not been at some time as unfortunate as the newer ones. Indeed, we are inclined to believe that as much as one-third of the mileage of American railroads has at some time or other passed through bankruptcy or been in such difficulties as to materially depreciate the value of its securities and to deprive, for a time at least, the holders of the interest due them.

Enough has been said, we think, to show that the construction of railroads is a hazardous business, and, therefore, that investors in them, as in other hazardous businesses, are entitled to a high rate of profit if they can get it. To limit them to the ordinary rate of interest on the most secure investments of the district in which their property is situated is simply to say that there shall be no more new railroads there. The comparison should be made, not with the peculiarly safe investments, but with those whose risks are equally great. The net earnings of the railroads of the United States, according to the latest and most complete returns, amounted to 52 per cent. on the face of the stocks and bonds. Now while the stock in some cases is much larger in amount than the money which it represents, in other and numerous cases millions of stock for which nearly its face was originally paid have been wiped out by the foreclosure of mortgages, and there are many roads whose capital account is much less than their cost. As the average amount of capital stock and bonded debt is but about \$55,000 per mile, and that is very much less than the average cost of railroads in any other country in the world, and covers some extraordinarily costly as well as some miserably cheap roads, it is questionable whether this property could be to-day replaced for less than the whole face of stocks and bonds. But admitting that one-half of the stock represents no value, we have our capital account reduced by 26 per cent., and the average proportion of net earnings to cost is almost exactly 7 per cent.

There can be no doubt whatever that the average earnings on railroad investments are extremely moderate. But the charges of extortion, it may be said, are not made against the "average railroad," but against those which do make very large profits. But this leads us back to our original principle, that large profits must be permitted on some lines to balance the losses on others and produce something like a reasonable average, if railroad investments are not to be entirely prohibited. The last report of the New York Central & Hudson River, which is probably the most profitable of the larger railroads, shows that the net earnings were 14.7 per cent. on the actual cost of the road, which is given as \$15,000 a mile less than the capital account and at a rate which is probably not at all greater than would be required to replace the property at this time. The amount divided among share and bondholders, however, was but about 10% per cent. on the cost of the property, the balance going into improvements. This is doubtless a high rate of profit, but it must be remembered that this is the most profitable or one of the most profitable of railroads, that it has become thus profitable only after many less profitable and often many unprofitable years, and that the number of very profitable roads is comparatively small.

Generally, we conclude, that if a limit is to be placed on the profits which railroad companies are to be permitted to earn, this limit should be something like the average return of hazardous business enterprises, and not the rate paid for the best secured loans.

**THE MESSINGHOUSE**  
**BLAWK-BROWN**  
**MANUFACTURED BY**  
**MESSINGHOUSE**  
**WISCONSIN**

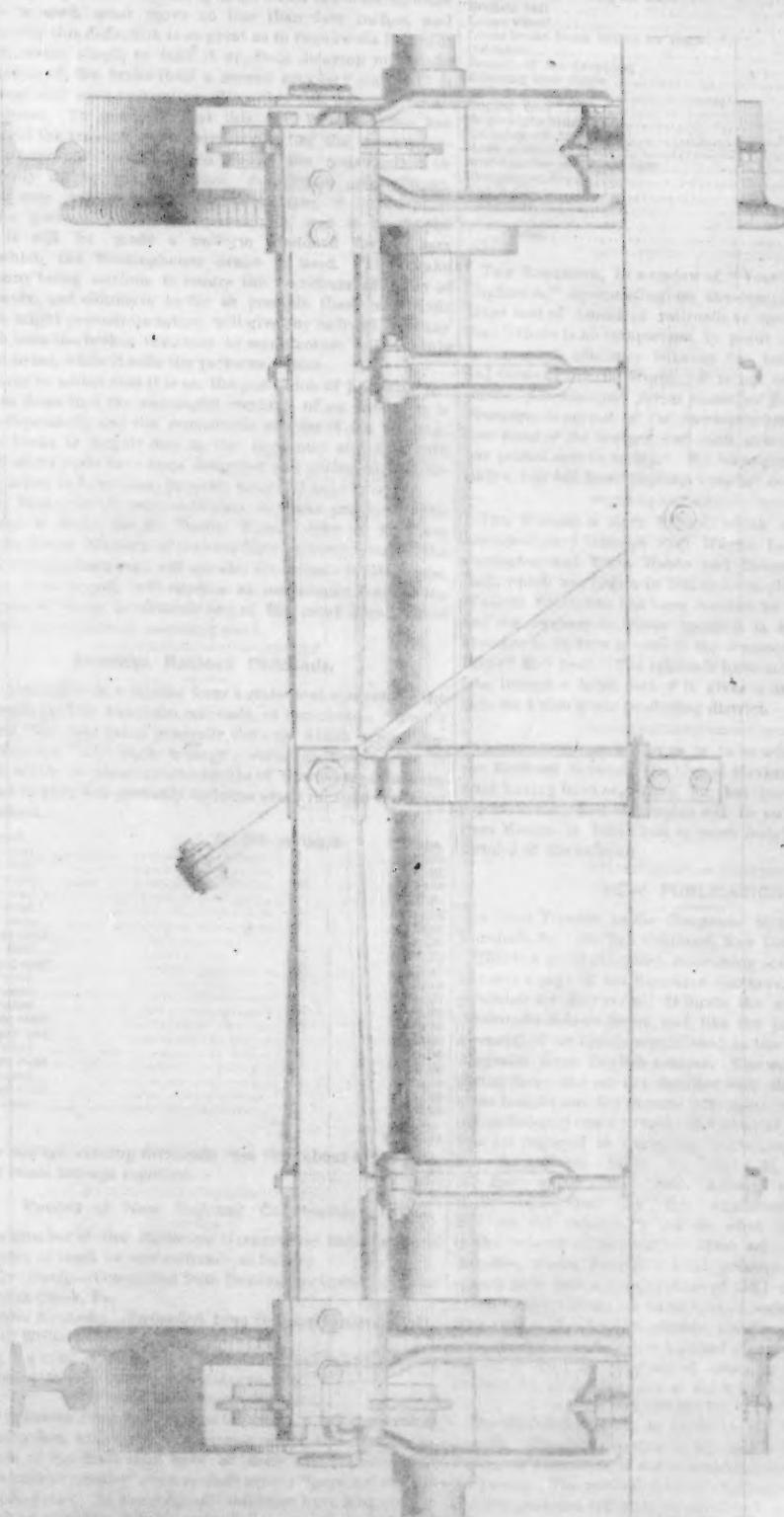


MICHIGAN SURVEY

<img alt="A detailed technical illustration of a mechanical device, likely a component of a printing press or similar machinery. The drawing shows a vertical assembly of various metal parts, including a main frame, a central vertical rod, and several horizontal levers or arms extending from the sides. The components are labeled with letters such as A, B, C, D, E, F, G, H, I, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, and numbers like 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 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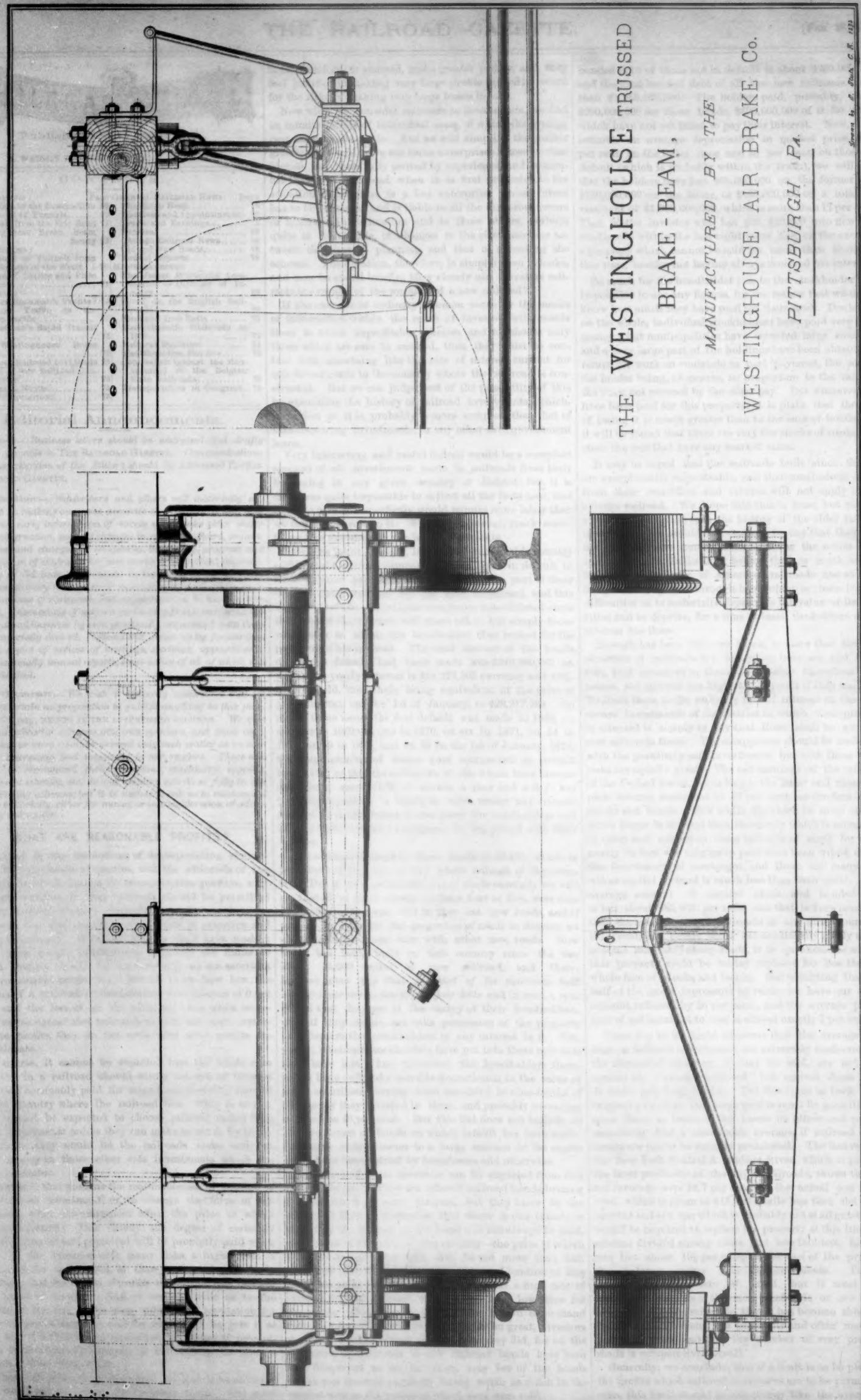
Any other provision would be difficult, as the members of Parliament are themselves shareholders in large numbers of these companies, so there would be a conflict of interest. This is one reason why the public sector has been unable to compete with the private sector, as the public sector has been forced to compete with itself. The public sector has been unable to compete with the private sector, as the public sector has been forced to compete with itself.

The American Bucaniae are derived from the Old World species by some kind of migration, and the number of the species in the two faunas are about equal.



the new Transistor  
Radio.

1000



THE WESTINGHOUSE TRUSSSED  
BRAKE - BEAM,

MANUFACTURED BY THE  
WESTINGHOUSE AIR BRAKE Co.

PITTSBURGH, PA.

Drawn by E. Stiles, C.R. 1121

**Passenger Traffic on the Union Pacific.**

Mr. Thomas L. Kimball, the General Passenger and Ticket Agent, has given to a local paper a statement of the passenger business of this line, which shows the bulk of the business as well as the earnings from it. We deduce from it the following:

	1872.	1873.
Number of passengers carried west.....	96,367	106,928
Number of passengers carried east.....	69,321	67,966
Total number of passengers carried.....	165,688	174,894
Passengers carried one mile.....	30,668,871	95,709,054
Average miles traveled by passengers.....	487	547
Total passenger earnings.....	\$3,370,312	\$3,887,204
Average receipt per mile traveled.....	4.18cts	4.06cts

Here we see that there is a very large excess of travel westward, which is common on most roads in new districts of the West where there is much immigration, but is extraordinary on the Union Pacific because of the preponderance of through traffic on it. Local traffic is usually almost exactly equal in both directions, as most people who go away from home come back again sooner or later. The increase was wholly in passengers westward, there being a slight decrease in the eastward movement. The increase in passenger mileage is about 19 per cent. The average length of trips is remarkably great—probably longer than on any other railroad in the world, being for the last year considerably more than half the length of the road, and this, too, doubtless from the dearth of local traffic. The increase in the average journey (which is about 12 per cent.) is probably due to the fact that through travel has increased faster than local.

The following table of passenger earnings by months is interesting, showing the currents of travel on this road:

	1872.	1873.
January.....	\$114,470 93	\$137,455 52
February.....	74,451 17	137,037 75
March.....	201,484 34	276,761 54
April.....	309,458 30	365,762 33
May.....	372,779 94	443,982 32
June.....	343,741 05	471,282 06
July.....	275,816 53	330,102 32
August.....	316,611 49	310,051 13
September.....	357,185 84	337,727 30
October.....	392,226 69	429,632 04
November.....	384,523 45	366,452 09
December.....	237,562 68	230,938 08
Total.....	\$3,370,312 41	\$3,887,204 48

The effect of the great storm of 1871, which nearly blocked the road for six weeks, is seen in these columns, as well as in the earnings of the year referred to, for it doubtless has deterred travelers from undertaking the journey in winter, while the road has suffered no more than the average Northern railroad (if as much) from snow since that time. The first quarter of the year yielded little more than one-ninth of the year's total passenger earnings in 1872 and one-seventh in last year. The average rate per mile decreases slightly—just 3 per cent.

This traffic, of course, depends mainly on the growth and prosperity of the Pacific States, and of the country on the line of the Union Pacific. Neither can increase in wealth or population without adding to the traffic, and especially to the passenger traffic, of this railroad.

**Mr. Eastman's Rapid Transit Bill.**

A public meeting was held at the Cooper Institute on the evening of February 24 to hear and discuss the bill which we have already noticed, and which was introduced into the New York Legislature by Mr. Eastman, of Poughkeepsie. The principal speaker on that occasion was Mr. Eastman himself, who set forth the reasons for the provisions in the bill, and for the amendments which have been made since it was first proposed. In its present form it provides for the appointment by the Governor of five commissioners, who shall have power to determine the plan, route, and raise the means by subscriptions or issuing bonds, the city to guarantee bonds to the amount of \$400,000 per mile for a double-track road and \$550,000 per mile for a four-track road; the Mayor of New York to offer a prize of \$20,000 for the best plan and \$7,000 and \$3,000 for the plans second and third in merit; the compensation of the commissioners to be \$10,000 per year; the fare not to exceed eight cents for any distance less than three miles and two cents per mile for longer distances, but during two hours in the morning and evening the trains to be run at half the above rates.

The bill and Mr. Eastman's remarks excited a very animated discussion, and it was soon made evident that neither had received that mature consideration which gives the public confidence. In fact, many of the provisions of the bill seem to be entirely premature. To fix upon the rates of fare before even a plan for the construction of the road is determined or its cost even approximately known, is certainly either risky financing or else is open to the suspicion that the public are to be induced to purchase a metaphysical cat in a bag. We are quite unprepared to say whether the rates of fare are too high or too low, and it is quite impossible that this can be determined until it is known how much the road will cost to construct and work, and how large a traffic it will have—facts which cannot be ascertained even approximately except by a very thorough investigation of the whole subject, made by experienced and skillful men. It was upon this very point that much opposition was at once manifested, and with much justice, we think. In fact, the idea of authorizing a commission to determine upon a plan, a route, raise the money and authorize the city to become responsible for four or five millions of dollars looks very like a loose way of doing business, even in these days of defalcations and betrayals of trusts. We have no doubt that Governor Dix would, if authorized, appoint as good men as he could select, but Governor Dix is human and therefore fallible, and some whom he might appoint on such a commission might be neither honest nor wise, and in such hands the power which the bill gives would certainly be dangerous.

The mistake of the bill is in making the Commission anything more than a board of enquiry and investigation. At present the Legislature is all in the dark, and it is only they

who are most ignorant of the whole subject who are at all certain what should be done; and the more experience and knowledge an engineer has, the more reticent he usually is and the greater his hesitation in recommending any specific plan. If Mr. Eastman would modify his bill, so as simply to give the Commission ample means and authority to make a thorough investigation of the whole subject, and report elaborately in their investigations at the next session of the Legislature, it would, we believe, do more to hasten the construction of some system of rapid transit than the undue haste and unsafe power and responsibility given by the bill in its present form possibly can. What is needed is to know, from persons whose opinions would have some value, what plan is the best, its cost, the best location, the expense of operating it, and the safest, surest and most honest way of having it constructed. A report of this kind from competent men, should it show a reasonable certainty of a reasonable income on the investment, would at once enlist the confidence of financiers and be almost certain to secure the requisite means for building the road with an organization properly guarded, which could be done much better with such a report before the members of the Legislature and the public than it can now.

**The Westinghouse Brake Beam.**

While it is of course desirable that a brake-beam should be perfectly stiff, whatever the power with which it is applied, it is especially desirable with continuous brakes, as the sum of the deflections of all the brake-beams may amount to a considerable amount. For instance, with a quarter-inch lost motion on each shoe, the long end of the brake lever, and with it the piston of the air cylinder when the Westinghouse brake is used, must move no less than four inches, and frequently this deflection is so great as to require six inches of piston stroke simply to take it up, thus delaying materially the action of the brake (half a second may be "material" in braking) and even preventing altogether full pressure on all the shoes. To guard against this, Mr. Westinghouse has designed the trussed brake-beam shown on the accompanying lithographic plate, which shows the construction so distinctly as to make further description superfluous. Great care has been taken in designing it to adapt it to the greatest possible requirements, and it is hoped that it will be made a uniform standard for all cars on which the Westinghouse brake is used. The brake company being anxious to secure the maximum efficiency of its brake, and eliminate as far as possible those conditions which might prevent its action, will give any railroad company which uses the brakes the right to manufacture and use this brake-beam, while it sells the patterns at cost.

It may be added that it is on the perfection of just such details as these that the successful working of an invention is often dependent, and the remarkable success of the Westinghouse brake is largely due to the ingenuity and skill with which all its parts have been designed and perfected, and the pains taken to have them properly used and kept in repair.

The brake, by the way, continues to make progress. The Chicago & Alton, the St. Louis, Kansas City & Northern and the Great Western of Canada have recently adopted the automatic apparatus and will use also the trussed brake-beams, which, it is hoped, will become as universally used as the brake itself, which is certainly one of the most important of modern improvements in rolling stock.

**American Railroad Dividends.**

We give below in a tabular form a statement concerning the dividends paid by American railroads, as reported in "Poor's Manual," the year being generally the one which expired before May last. The whole mileage covered in Poor's table is 57,323, which is about seven-eighths of the average mileage worked in 1872, but probably includes every railroad that paid a dividend:

Dividend.	No. Cos. paying it.	Mileage.
10 per cent.....	1	12,00
12 per cent.....	4	243,31
11 per cent.....	1	140,75
10 per cent.....	20	4,567,64
9 per cent.....	6	1,616,58
8 per cent.....	22	4,735,67
7½ per cent.....	1	122,01
7 per cent.....	18	6,205,72
6½ per cent.....	2	266,41
6 per cent.....	20	1,970,64
5 per cent.....	6	284,37
4 per cent.....	5	439,90
3½ per cent.....	1	98,50
3½ per cent.....	1	121,00
3 per cent.....	8	742,96
2½ per cent.....	1	67,00
2 per cent.....	5	760,59
1½ per cent.....	2	330,00
1 per cent.....	1	5,75
	135	22,730,19

The mileage earning dividends was thus about 40 per cent. of the whole mileage reported.

**Record of New Railroad Construction.**

This number of the RAILROAD GAZETTE has information of the laying of track on new railroads as follows:

*Berks County.*—Completed from Reading northward 10 miles to Maiden Creek, Pa.

*Eastern Kentucky.*—Extended from Grayson westward 11½ miles to Willard, Ky.

This is a total of 21½ miles of new railroad, making 103½ miles completed in the United States in 1874.

*THE ILLINOIS LEGISLATURE* has before it a bill concerning railroad police, which requires, among other things, that the railroads of the State shall have all their cars supplied with an "automatic coupler" such as shall secure "personal safety" in coupling cars. As the railroad companies have long sought for such an appliance "and mourned because they found it not," it will help matters a little if the Legislature will find such a coupler before they compel the companies to use it. But perhaps the Illinois Legislature intends to improve on

the patent system, which rewards people for making useful improvements, by a policy which will punish people for not making desirable inventions. We suggest a "judicious" series of penalties in the shape of fine and imprisonment for the failure to adopt locomotives which burn no fuel, or only half as much as the kind now used; also for cars which will carry twice as much and weigh and cost half as much as the present uneconomical patterns, the cost of the construction and hauling of which is eventually charged against the customers of the railroads.

Another provision of the law prohibits the running of trains within the limits of towns and cities at a speed faster than four miles an hour. This doubtless will do something to secure safety, but it may have an unfavorable effect on Chicago suburban traffic, as the railroads run from four to seven miles within the city, and an hour to an hour and three-quarters devoted to getting over that part of the journey twice a day would be objectionable to busy men. But as when this and similar laws have gone into effect there will be no busy men in Chicago, perhaps it is just as well.

**THE ACCIDENTS ON THE READING RAILROAD** are reported and classified in its report for 1873, for the past fourteen years, with a statement of the causes and the number of cars broken by every kind of accident. By this report, in 1873 there were 191 accidents, by which 56 persons were killed, 79 injured, 140 cattle killed and 592 cars broken. The causes and the number of cars broken by each are reported as follows:

Broken axle .....	51
Broken wheel .....	49
Broken spring and pedestal .....	3
Broken bumper lying on track .....	47
Broken rail .....	44
Loose wheel .....	8
Loose brake-block falling on track .....	7
Collision .....	176
Bottom of car dropping .....	18
Running over cattle .....	13
Switch wrong .....	67
Ropping cars .....	11
Engine pushing .....	34
Running off track .....	15
Rock sliding on track .....	12
Merchandise falling off car .....	15
Stopping suddenly .....	6
Truck out .....	2
Unknown .....	14
Total.....	592

**THE ENGINEER**, in a review of "Voso's Manual for Railroad Engineers," commenting on the comparatively very low average cost of American railroads as stated in this book, says that "there is no comparison in point of durability, solidity and general efficiency between the ordinary American lines and those of the Old World. It is not an uncommon circumstance, for example, for a passenger from New York to San Francisco to get out of the carriage when the train is passing over some of the bridges and walk over them, after the train has passed over in safety." We have put the last sentence in italics, but full-faced capitals wouldn't do it justice.

**THE WABASH & ERIE CANAL**, which extends from Toledo southwestward through Fort Wayne, Logansport, Lafayette, Covington and Terre Haute and Bloomsburg to Evansville, Ind., which was begun in 1832 and completed in 1853, at a cost of about \$6,000,000, has been worked for some years at a loss, and the company in whose hands it is announced that it will abandon it, or turn it over to the trustees of the State, on the 10th of May next. The railroads have made it practically useless, though a large part of it gives a direct outlet to Lake Erie for a rich grain producing district.

**COMPETITION WITH MULES** is to be tried against the Mexican Railroad between the city of Mexico and Puebla, a mule train having been organized for that purpose recently. It is reported, also, that cart trains will be put on the entire route from Mexico to Vera Cruz to carry freight between the very termini of the railroad.

**NEW PUBLICATIONS.**

*A Short Treatise on the Compound Steam Engine.* By John Turnbull, Jr. (D. Van Nostrand, New York, 1874.)

This is a small pamphlet, containing scarcely matter enough to cover a page of the RAILROAD GAZETTE, and is sold by the publisher for fifty cents. It forms the eighth volume of *Van Nostrand's Science Series*, and, like the preceding volumes, is a reprint of an article republished in the *Electric Engineering Magazine* from English sources. The work will be useful in giving those who are not familiar with the compound engine some insight into the general principles, but the treatment is not sufficiently exact to make the essay of much value to those who are engaged in designing machinery of this character. In the steam table on page 21, the temperatures of the steam do not accord very closely with those established by the experiments of Regnault, and we are unable to see in what manner the figures in the column of mechanical effect are obtained. Take, for instance, steam having a total pressure of 15 pounds per square inch, and a temperature of 213.1 or 212.8 degrees, as given by the author. A cubic inch of water at this temperature weighs about 0.0345 pounds, and the number of units of heat required to evaporate a pound of water at this pressure is 965.85, so that the mechanical effect, in foot-pounds, of the evaporation of a cubic inch of water will be,

$$0.0345 \times 965.85 \times 72 = 25,760.$$

The mechanical effect, as given in the table, is 2,086 foot-pounds. The other column in this table, showing the relative volume of the steam, is not in accordance with the latest experiments. The method given for finding the ratio of the high and low-pressure cylinders is useful and convenient in a few special cases, but is not applicable to compound engines as generally designed.

In making these criticisms, we do not wish to be understood as denying all merits to the little work, which we believe to be

a useful addition to the current literature on this subject.  
*Schem's Statistics of the World.*—A great many students, and journalists particularly, have frequent occasion to know many things about the area, population, size of army, national debt, tonnage of marine, imports and exports, etc., of various foreign countries—information which it is not always easy to get, and when got is likely enough too old to be of much value. The work named above, which is published by G. J. Moulton, New York, and edited by Prof. A. J. Schem, aims to give this and other information in a semi-annual publication, so that it is the Editor's fault if it is not up to the times.

Indispensable to the value of statistics is accuracy, and of the accuracy of these tables we cannot judge until after long use; but we can say that the matter covered is of great value, and that the tables are easily consulted. One that we can criticise is that of the railroads of the United States, the length of which is given as 60,852 miles, while the time is not specified; but long before this work was published the tables for the end of 1872 had been published showing a total of more than 67,000 miles.

*The Coal Trade.*—This pamphlet of 73 octavo pages, which is an annual publication prepared by Mr. Frederick E. Seward, editor of the *Coal Trade Journal*, announces on its title page that it is "a compendium of useful information relative to coal production, prices, transportation, etc., at home and abroad, with many facts worthy of preservation for future reference." It gives statistics of the coal mines of each of the States from the census of 1870, a very brief description of the anthracite coal trade, monthly prices of anthracite for the past two years, a diagram showing the progress of the anthracite coal production for 52 years, cost of transportation for five years, maps of the Bloomsburg, the Broad Top, the Pacific coast, and the Cumberland coal regions, separate descriptions of many coal regions in various parts of the country, statistics of the coal trade of several cities, and other statistics of the kind, some of them relating to foreign coal production—all being of value in studying many questions.

## General Railroad News.

### ELECTIONS AND APPOINTMENTS.

At the annual meeting of the Marietta & Cincinnati Railroad Company in Cincinnati, recently, the following directors were elected: W. W. Scarborough, R. M. Bishop, James D. Lehmer, Nathaniel Wright, Cincinnati, O.; W. T. McClinton, William Waddle, Chillicothe, O.; Wylie H. Oldham, Marietta, O.; J. M. Camden, Parkersburg, W. Va.; Robert Garrett, John King, Jr., Thomas Whitridge, John Donnell Smith, Allan A. Chapman, Baltimore, Md. The board elected officers as follows: President, John King, Jr.; Treasurer, Wylie H. Oldham; Secretary and Auditor, Charles F. Low; Cashier and Registrar, William E. Jones.

At the annual meeting of the Fort Wayne, Jackson & Saginaw Railroad Company in Jackson, Mich., February 20, the following directors were elected: P. B. Loomis, D. Merriman, E. A. Webster, W. D. Thompson, W. R. Reynolds, H. H. Smith, Jackson, Mich.; E. O. Grosvenor, Jonesville, Mich.; A. P. Edgerton, John H. Clark, John H. Bass, G. C. Evans, Fort Wayne, Ind.; J. A. Woodhull, Steuben County, Ind.; C. McClellan, De Kalb County, Ind. The board elected the following officers: President, P. B. Loomis; Vice-President, E. O. Grosvenor; Secretary, E. Pringle; Treasurer, B. G. Chapin; Executive Committee, P. B. Loomis, E. A. Webster, E. O. Grosvenor.

At the annual meeting of the Mineral Range Railroad Company in Hancock, Mich., January 30, the following directors were elected: J. A. Close, P. Ruppe, J. Baer, C. E. Howell, P. Schennerman, J. H. Chandler, M. M. Moralee, Hancock, Mich.; Jay A. Hubbell, R. M. Hoar, W. Harris, J. R. Devreaux, Houghton, Mich.

The officers of the Cairo & Vincennes Railroad Company for the ensuing year are: President, J. P. Morgan; Vice-President, J. N. Robinson; Treasurer, Anthony J. Thomas; Secretary, Roswell Miller.

Mr. William Z. Larned, a New York lawyer and a director of the company, has been appointed Receiver of the New Jersey West Line Railroad by the New Jersey Court of Chancery.

Mr. William S. Sneden, Receiver of the New Jersey Southern Railroad, has made the following appointments: Rufus Blodgett, Superintendent and Master Mechanic; George O. Waterman, Auditor and Cashier; Charles P. McFaddin, General Ticket Agent; W. J. Parmentier, General Freight Agent. Remittances are to be sent to the Receiver at the Long Branch office. Freight reports and requisition for cars will be sent to the General Freight Agent at Sandy Hook. The office of the Superintendent will be at Manchester, N. J. Ticket reports and all other communications will be sent to Long Branch, N. J.

At the annual meeting of the Atlantic & Gulf Railroad Company, in Savannah, Ga., February 11, the following directors were elected: John Scovell, R. D. Arnold, William Duncan, C. E. Groover, Henry Lathrop, Edward Lovell, Alfred Haywood, J. M. B. Lovell, C. W. Kirkland, Savannah, Ga.; R. H. Hardaway, A. T. McIntyre, W. J. Young, Thomas County, Ga.; C. J. Munnelly, W. O. Fleming, Decatur County, Ga.

At the annual meeting of the Levis & Kennebec Railway Company in Levis, Quebec, recently, the following directors were elected: Hon. J. G. Blanchet, Hon. Thos. McGreevy, Hon. A. R. C. De Lery, P. Garneau, E. Beaudet, F. X. Lemieux, L. P. Demers, J. Jobin, P. C. Dumontier.

By authority of the board of directors, Col. A. S. Buford, President of the Atlanta & Richmond Air Line Railway Company, has appointed Col. Larkin Smith Treasurer and James J. Davies Auditor.

Mr. E. Van Etten has been appointed Train Dispatcher at Port Jervis on the Delaware Division of the Erie Railway.

At the annual meeting of the Delaware, Lackawanna & Western Railroad Company in New York, February 24, the following officers were elected: President, Samuel Sloan; Treasurer, Andrew J. Odell; Secretary, Frederick F. Chambers; Managers, William E. Dodge, Moses Taylor, Rufus R. Graves, Simeon B. Chittenden, George Bliss, Percy R. Pyne, Wilson G. Hunt, Henry A. Kent, New York city; William Walter Phelps, Englewood, N. J.; John I. Blair, Blairstown, N. J.; A. L. Dennis, Newark, N. J.; John Brisbin, James Blair, Scranton, Pa.; George Bulkley, Southport, Conn. The only change is the election of Mr. A. L. Dennis in place of Denning Duer in the board of managers.

Mr. William M. Parker, formerly Superintendent of the Boston, Hartford & Erie Railroad, and later of the Connecticut & Passumpsic Rivers road, has been appointed Superintendent of the Boston & Lowell and Lowell & Nashua railroads, in place of Mr. J. B. Winslow, resigned. The appointment will take effect April 1.

—Mr. Charles H. Comee, of Fitchburg, Mass., has been appointed Assistant Superintendent of the Fitchburg Railroad, and will have immediate charge of the Vermont & Massachusetts Division, which comprises the lately leased Vermont & Massachusetts and Troy & Greenfield roads.

—Mr. N. Seyfert has been appointed Cashier of the Eastern Kentucky Railroad Company, in place of Mr. N. B. Grahn, who has resigned to take charge of the Iron Hills Furnace.

—Gen. Z. F. Smith, formerly connected with the Cumberland & Ohio Railroad Company, has been chosen President of the Austin & Pacific Short Line Railroad Company.

### TRAFFIC AND EARNINGS.

—The earnings of the Mineral Range (narrow gauge) Railroad for the three months ending Dec. 31 were:

Earnings (\$1,554 per mile) ..... \$19,422.31  
Expenses (58.94 per cent.) ..... 11,446.72

Net earnings (\$638 per mile) ..... \$7,975.60

—The earnings of the Louisville, Cincinnati & Lexington Railroad for the six months ending December 31, 1873, were:

Earnings (\$3,387 per mile) ..... \$650,247.67  
Expenses (70 per cent.) ..... 455,173.37

Net earnings (\$1,016 per mile) ..... \$105,074.30

The gross earnings show an increase over the corresponding six months of 1872 of \$24,190.33, or 3% per cent.

—The earnings of the Great Western Railway of Canada for the week ending January 30 were: 1874, £20,170; 1873, £15,777; increase, £4,393, or 27% per cent.

—The earnings of the Grand Trunk Railway for the week ending January 31 were: 1874, £32,800; 1873, £28,700; increase, £4,100, or 14% per cent.

—The earnings of the Erie Railway for the second week in February were: 1874, \$25,382; 1873, \$386,137; decrease, \$60,755, or 15% per cent.

—The earnings of the Marietta & Cincinnati Railroad for the year ending December 31 were as follows:

1873.	1872.	Increase.	Decrease.	Per Ct.
Passengers ..... \$503,816.91	\$484,132.72	\$19,684.19	.....	4%
Freight ..... 1,507,617.35	1,400,567.21	96,050.14	.....	7
Miscellaneous ..... 115,440.47	135,464.72	.....	\$20,024.25	14%
Total ..... \$2,126,874.73	\$2,029,161.65	\$97,710.08	.....	4 13/16

The earnings were \$7,489 per mile in 1873, against \$7,145 per mile in 1872.

—The earnings of the Atlantic & Gulf Railroad for the year 1873 were:

Earnings (\$2,889 per mile) ..... \$1,005,947.12
Ordinary expenses (69.67 per cent.) ..... 700,819.66
Extraordinary expenses ..... 49,427.66

Total expenses (74.55 per cent.) ..... \$750,247.22

Net earnings (\$737 per mile) ..... \$255,699.90

The gross earnings show an increase over 1872 of \$21,981.06, or 2 1/4 per cent.

—The following figures, said to be official, have been published as the earnings and expenses of the Pennsylvania Railroad for the year 1873:

Earnings.	Expenses.	Net earnings.
Pennsylvania Railroad ..... \$24,886,000.90	\$15,440,905.16	\$9,445,703.74
United Railroads of New Jersey ..... 8,516,739.03	6,792,188.05	1,724,551.88
Del. & Raritan Canal ..... 1,590,100.12	883,321.46	706,778.68
Total ..... \$34,992,848.05	\$23,115,814.67	\$11,877,034.28

—The earnings of the Michigan Central Railroad for the second week in February were: 1874, \$131,414; 1873, \$108,177; increase, \$23,237, or 2 1/2 per cent.

—The earnings of the Marietta & Cincinnati Railroad for the second week in February were: 1874, \$35,416; 1873, \$39,188; decrease, \$3,772, or 9% per cent.

### PERSONAL.

—Mr. John S. Dunlap, General Agent for New England of the Erie Railway, died in Boston, February 18, aged 54 years. Mr. Dunlap had held his last position for 15 years, having been for five years previously General Superintendent of the Rutland & Burlington Railroad. When a young man he was for several years on the Boston & Maine Road, holding the position of Master of Transportation.

—Mr. John F. Dickson has resigned his position as General Superintendent of the Texas & Pacific Railway to take charge of a line further east. Mr. Dickson has had charge of the road ever since it passed into the hands of the present company and was its Superintendent previously, when it was known as the Southern Pacific. The appointment of his successor has been already noted.

—Mr. George Westinghouse, Jr., inventor of the atmospheric brake bearing his name, and President of the Westinghouse Air Brake Company, sailed for Europe on the 25th, to go beyond two months, on business connected with the introduction of his brake in that country, where, judging by the numerous reports of fatal collisions which we hear, it is very much needed.

—Mr. Rush R. Sloane, late President of the Cincinnati, Sandusky & Cleveland Company, was to have had his preliminary examination on the charges of embezzlement in Sandusky, O., February 17, but he failed to appear and his bail was declared forfeited. It is said that he had raised a considerable amount of money, and it is generally supposed he has gone to Canada. There were 17 charges against Sloane, and the amounts said to have been stolen were: in money, \$12,889.62; promissory notes, \$22,529.26; bonds, \$4,800; total, \$40,218.88. A young lady of Elyria, O., to whom Mr. Sloane was soon to have been married, left that place about the same time with her parents, and as the latter returned a few days afterwards without her, she is believed to have joined Mr. Sloane in his flight.

### CHICAGO RAILROAD NEWS.

#### Illinois Central.

The company is preparing to plant forest trees along its line between Chicago and Champaign, and raise its own ties in time—an example which might be imitated with profit, probably, not only in the West, but almost everywhere.

#### Pacific Mail Steamers.

The railroad lines running west from Chicago and connecting with the Union Pacific, are interested in two new lines of steamers established between San Francisco and Australia and China, viz.: The American & Australasian Mail Steamship Line, and the China & Pacific Steamship Company. Each of these companies will send one steamer from San Francisco monthly.

#### Chicago, Burlington & Quincy.

In conformity to contracts between this company and the following corporations of whom it leases branches, the company invites proposals, to be made before noon of March 4 to John N. Denison, Chairman of the Board, at Boston, for the sale to it of the 8 per cent. bonds of these companies. The

amounts denoted below will be purchased of the lowest bidder, at a price not exceeding par and interest. The proposals are to be endorsed "Proposals for Branch Bonds."

American Central Railroad Company, eight per cent., due July 1, 1878 ..... \$50,000

Peoria & St. Paul Railroad Company, eight per cent., due April 1, 1878 ..... 20,000

Carthage & Burlington Railroad Company, eight per cent., due May 1, 1879 ..... 50,000

Quincy & Warsaw Railroad Company, eight per cent., due July 1, 1890 ..... 40,000

Illinois Grand Trunk Railroad Company, eight per cent., due October 1, 1890 ..... 20,000

Otsego, Oswego & Fox River Valley Railroad Company, eight per cent., due July 1, 1900 ..... 40,000

The company also invites proposals, which will be opened at noon on March 2, for the sale to it of \$419,000 of the 7 per cent. convertible bonds of the Burlington & Missouri River Company, (second series) and \$165,000 of the 8 per cent. convertible bonds of the same company (third series). The terms are the same as above.

This is a total of \$864,000 of bonds, which will absorb most of the new issue of \$1,000,000 of Chicago, Burlington & Quincy Co., proposals for which were opened on the 20th,

The company has rented the second floor of the building adjoining its present place and have fitted it up for General Freight and Passenger Agents' offices. The General Freight Agent has a large room for the clerks, a private office, and a large store-room, and the General Passenger Agent an office for clerks.

### OLD AND NEW ROADS.

#### Ogdensburg & Lake Champlain.

Suit has been commenced in the name of the Attorney General of the State of New York for the forfeiture or the charter of this company on the ground of non-use. It is stated that the lease to the Vermont Central trustees was made in defiance of law, which prohibited a lease to parties outside the State. On the other hand it is claimed that the Vermont Central trustees formerly and the Central Vermont Company now does not operate the road under a lease, but merely a contract to operate. This distinction, however, appears to be merely technical, there being a lease for all practical purposes.

The Central Vermont Company has withdrawn all its rolling stock except that actually running in trains, and no more Central Vermont cars are sent up to load. When cars are needed those of other companies are used. The Central Vermont is not a party to the suit.

#### Toledo, Peoria & Warsaw.

The trustees of the consolidated mortgage have commenced suit in the United States Circuit Court at Chicago to foreclose the mortgage. This mortgage is for \$6,200,000, and the issue of bonds was originally made for the purpose of taking up former indebtedness.

A circular from the Superintendent directs that all remittances or drafts for business subsequent to January 31, 1874, shall be sent to John Newell, Agent, No. 58 Michigan Avenue, Chicago. Reports relative to the freight or ticket business are to be sent, as heretofore, to the general office in Peoria, Ill.

Suit has also been commenced to compel the trustees to exchange for consolidated mortgage bonds some of the equipment bonds of 1869 which were not exchanged at the same time as the other bonds of that issue, and which the trustees subsequently declined to exchange.

#### Illinois & St. Louis Bridge.

In the case between this company and the Keystone Bridge Company which was referred to arbitration, the arbitrators have decided that there is due the Keystone Bridge Company about \$250,000, including \$125,000 percentage upon the estimates retained as the work progressed.

#### Green Bay & Minnesota.

The contract for the grading of the branch to the east bank of the Mississippi opposite Winona, Minn., has been let, and work is to be commenced at once.

The question of issuing bonds of the city of Winona to the amount of \$50,000 in payment of the bonus promised to the company has been referred to the people at a special election. Utica, Ithaca & Elmira.

Arrangements are being made, it is said, for the extension of this road to Corning, N. Y., some 14 miles.

#### New Jersey Southern.

Mr. W. S. Sneden is now fully in possession of the road as Receiver, and trains have commenced running after a suspension of about five weeks.

#### Plymouth, Kankakee & Pacific.

An agreement has been arrived at by the representatives of the company, the bondholders and the floating-debt creditors. Certain bonds are to be placed in the hands of a trustee for the benefit of the floating-debt creditors, and no opposition is to be made to the sale of the franchise and property in bankruptcy.

#### Davenport Union.

This project for the construction of a road to bring the Davenport & St. Paul into the city of Davenport has been abandoned, the Davenport & St. Paul Company not being willing to co-operate with the projectors, at least until its suit with the city as to the right to lay tracks on certain streets has been decided.

#### Tennessee Central.

About 12 miles of the grading between Trenton, Tenn., and McMinnville has been completed and the work is being pushed forward.

#### Brunswick & Albany.

The attorneys for the holders of the bonds endorsed and afterwards repudiated by the State of Georgia, have made a proposition to Gov. Smith and have offered to return to the State \$3,300,000 of the bonds, provided the State will give in return endorsed bonds at the rate of \$15,000 per mile for 169 miles completed and will hereafter endorse bonds to the same amount per mile as the road is extended from Albany to Euclid. It is not thought probable that the proposition will be accepted.

#### Dallas & Wichita.

This road has been located for 20 miles from Dallas, Tex., to Hagan's Ford. The right of way is being cleared out and the contract for grading is to be let at once.

#### Niagara Suspension Bridge.

The Niagara Falls Gazette says that in the case between the Canadian Attorney-General and the Suspension Bridge Company, Vice-Chancellor Strong has given judgment on the following principal points: 1. That the agreement of October, 1853, between the Bridge Company and the Great Western Railway, by which the latter obtained the exclusive right to use the bridge, is ultra vires and illegal, as being in excess of their corporate powers. 2. That the bridge is public, open to all companies that can reach it. 3. That the Canada Southern

and the Erie & Niagara, not having shown a connection with the bridge, are not entitled to the relief prayed. 4. That the Court will not interfere by injunction, because its jurisdiction does not extend beyond the middle of the river, and an order will not be made which cannot be enforced.

#### Berks County.

Track is laid from Reading, Pa., northward to Maiden Creek, 10 miles. That section of the road was opened for traffic February 23.

#### San Francisco & North Pacific.

The car and machine shops at Donahue, Cal., with several cars, were burned February 19, the loss being stated at \$50,000.

#### Alabama & Chattanooga.

An appeal from the Circuit Court to the Supreme Court of the United States has been taken. The necessary bonds have been filed and the case will go to the Supreme Court, the Receiver continuing in possession.

#### Springfield & Northwestern.

A train belonging to this company was levied upon by the Sheriff at Antioch, Ill., February 13, on suit of some parties who had not been paid for the right of way. A writ of replevin was subsequently sued out by the contractors, who claimed the property.

#### North Shore, of Canada.

The Toronto (Ont.) *Monetary Times* says: "The terms of the sale of the North Shore Railway contract by the American firm of Keith, Dunlop & Smith to Mr. McGreevy are said to be a total amount of \$225,000, payable \$25,000 cash down, and the balance in bills for \$50,000, payable on the 15th of each month till all is paid. Mr. McGreevy to procure a resolution of the directors discharging the Americans from all liability as regards said contract."

Mr. S. Seymour, Chief Engineer, informs us that the contract for the construction of this road has been assumed by Hon. Thomas McGreevy, of Quebec, who has since left for Europe for the purpose of making his financial arrangements to push the work vigorously on the opening of the coming season. The company has accepted the "Railway Aid Act of 1874," and there is every prospect that the main line will be opened for business during the year 1875.

#### Central, of Iowa.

At a meeting of the bondholders held in Boston, February 19, the committee appointed at a previous meeting reported that a majority in amount of the bondholders had agreed to the extension of two years asked for by the company. The committee also reported that the earnings for 1873 had fallen short of the expectations of the directors and in the committee's opinion the company would not be able to resume payment of interest in 1875. The Milwaukee & St. Paul Company had offered to lease the road for 30 per cent. of gross earnings with a guarantee of interest on the first mortgage bonds. The committee therefore recommend that the road be sold under foreclosure, and the company reorganized, and the offer of lease accepted. In the reorganization the first-mortgage bonds to rate first, the second-mortgage bonds and over-due coupons second, the floating debt third and the stock last. After a long debate, the report being protested against on the ground that sufficient guarantees for the proposed lease were not offered, the report was received, and the recommendations adopted.

The indebtedness of the company is about as follows: First-mortgage 7 per cent. gold bonds, \$3,700,000; second-mortgage 7 per cent. gold bonds, \$25,000; floating debt, \$950,000.

#### Cincinnati, Rockport & Southwestern.

A contract has been made with the Indianapolis Rolling Mill Company to furnish rails for the section from Rockport, Ind., northeast to the Spencer County line, a distance of about 25 miles.

#### Michigan Lake Shore.

Mr. D. P. Clay, Receiver of this road, has been authorized by the Court to issue bonds for the purchase of equipment, there being none on the road. The bonds are to bear 10 per cent. interest, have five years to run and the amount must not exceed \$250,000.

#### Camden, Gloucester & Mt. Ephraim.

Trains commenced running regularly over this road from Camden, N. J., to Gloucester February 14. It is of 3-foot gauge and is the first passenger railroad of that gauge in New Jersey, and the first railroad built and opened for business under the general railroad law.

#### Fort Wayne, Jackson & Saginaw.

At the annual meeting in Jackson, Mich., February 20, the stockholders voted to authorize the board of directors to issue preferred stock and to take up the interest coupons due in January. Suits are to be commenced at once to compel deeds of right of way according to contracts.

#### Atlantic & Gulf.

At the annual meeting in Savannah, Ga., February 12, resolutions were unanimously adopted instructing the directors to continue their efforts to secure the extension of the road from Bainbridge westward to Pollard.

#### Lake Superior & Mississippi.

The St. Paul (Minn.) *Press* says that the negotiations between this company and the Northern Pacific have been completed, and that the latter company will surrender the lease and turn over the road to the company, probably, on March 1. The *Press* also states that in addition to the purchase of rolling stock it will be necessary to relay nearly all the track from St. Paul to Centerville, 17 miles, at once, that part of the track being in very bad condition.

#### Boston, Concord & Montreal.

A large force is at work on the extension of the branch to the Twin Mountain House from that point to the Fabian House, a distance of nine miles. The branch is to be finished in June, in time for the summer travel to the White Mountains.

#### New Jersey West Line.

On application of the bondholders the Chancellor of New Jersey has issued an injunction prohibiting any further work on the road, and has appointed Mr. William Z. Larned Receiver. The road is in operation from Summit, N. J., west to Bernardsville, 15 miles, and nearly all the grading from Summit to Newark was done some two years ago.

#### Iowa Eastern.

It is said that arrangements are being made to complete this road to Elkader, Ia. It is now in operation from Beulah Junction, 10 miles west of McGregor on the Milwaukee & St. Paul, southwest 16 miles to a point  $\frac{1}{2}$  miles from Elkader. The road, which is of 3 feet gauge, is laid with iron of 30 pounds to the yard and is said to have cost about \$12,000 per mile. It has been doing a good business during the present season. In the month of December 158 (standard gauge) car-loads were transferred to the Milwaukee & St. Paul at Beulah Junction.

#### Brockford, Rock Island & St. Louis.

The directors announced in the German papers that they were unable to meet the interest due February 1, in accordance with the contract of July 1, 1872, by which the bondholders agreed to accept one-half of the face of the coupons as

payment in full. They give as reasons for this inability: 1. The necessity which they have been under to pay for fencing, etc., from net earnings, because the non-consent of a little more than one-tenth of the bonds has prevented their selling the Sagetown & Keithsburg Branch, as was contemplated in the contract, and applying the proceeds thereof to such indispensable improvements. 2. A complete failure of the potato crop and the very poor corn crop along the road in 1873, from which two crops the road heretofore has received half its earnings. 3. The unfavorable effects of the new Illinois railroad laws. 4. The reduction of traffic by the panic last fall.

The closing paragraph of the circular published is as follows:

"The management wishes to state that it has entered into no further expenses or obligations, but that it has employed all the receipts of the road for its legitimate obligations. When the contract (of July 1, 1872) was proposed, they had full faith that the receipts would be sufficient for the reduced interest on the bonds; and we still hope that this embarrassment is only temporary, and that the management will soon be able to resume interest payment; but as we have once been so greatly mistaken, we are no longer so sanguine as before, and ready to meet, consider and carry out any practicable arrangement to place the road on such a basis that it will be liable for only such amounts as it may receive."

Accompanying the circular was a statement of the receipts and expenses of the eighteen months ending with December last (estimated for the last two months) which shows net receipts for that time amounting to \$267,882, while the company has paid \$83,118 more than that amount for interest, which for the whole of that time amounted to something more than \$450,000.

The plan of reorganization which was to be submitted to a meeting of the bondholders and stockholders in New York, February 26, included an issue of \$10,000,000 preferred stock, to be exchanged for the outstanding bonds, and \$3,500,000 common stock, to be exchanged for the old stock and floating debt claims. The funded debt is now \$9,000,000, the floating debt about \$250,000 and the stock \$6,500,000. About five-sixths of the bonds are held in Germany.

#### Oregon & California.

There was a meeting of the bondholders at the invitation of their committee in Frankfort on the 28th of January, at which resolutions were adopted by a vote of 4,008 to 104 to the following effect:

That the agreement made by the committee with Ben Holladay, who owns a majority of the stock of the company, may be confirmed. This agreement is to the effect that Mr. Holladay will guarantee the payment of \$50,000 yearly towards the interest on the bonds, and the banking house of Sulzbach & Co. (through whom the bonds were sold in Germany, we believe) will endorse Holladay's guarantee. The committee thought that the laws of Oregon might support a claim against Holladay for the face of the capital stock, on which nothing has been paid, but that as Holladay's large property has been put into the hands of relatives and friends, no judgment of the kind could be executed; also that a foreclosure would be costly and disadvantageous.

#### Grand Southern.

This company's road is to extend from St. John, N. B., westward along the shore to St. Stephen, opposite Calais, Me. It is intended to connect with the proposed Bangor & Calais Shore Line road, from Calais to Bucksport or Bangor. A subsidy has been promised by the New Brunswick Government.

#### St. Croix & Penobscot.

It is proposed to build a extension of this road (now 22 miles long, from Calais, Me., to Princeton) from Princeton to Bangor, about 88 miles. The city of Calais is debating whether to extend aid to this project or to the Bangor & Calais Shore Line.

#### Bangor & Calais Shore Line.

It is said that work will soon be commenced on this road. The company hopes to get substantial aid from Calais.

#### Mexican Railroads.

A telegram from the City of Mexico dated the 15th says briefly that English capitalists refuse to lend money to the new railroad company of "fourteen merchants," which has now the sole right to build railroads in the Republic.

#### Meetings.

Annual meetings will be held as follows:

The Pennsylvania Railroad Company, at Musical Fund Hall, Philadelphia, at 10 a. m. on March 10. The election of directors will be held March 24, at the company's office.

#### Boston & Lowell.

A branch line is talked of to leave the main line of the Boston & Lowell in Wilmington, Mass., and run thence a little east of north through Andover, North Andover and West Bedford to Haverhill, a distance of about 18 miles.

#### Boston, Revere Beach & Lynn.

Arrangements are being made for the organization of a company to build this road, and meetings are being held in its favor. The road is to run from the Saugus Branch of the Eastern Railroad eastward to Revere Beach and thence along the beach to Lynn.

#### Morris Canal.

Negotiations are going on for the construction of a branch from the canal near Centreville, N. J., to the Passaic River at Dundee. A lock is to be put into the Dundee Canal, so that boats can pass the dam there and be towed down the river. This short cut will save something in distance and some 16 miles of canal navigation, including the passage through a number of locks and over the inclined planes at Bloomfield and Newark.

#### Statens Island & New Jersey Suspension Bridge.

A bill is before the New Jersey Legislature to incorporate this company to build a bridge across the Kill van Kull from Constable's Point, N. J., to New Brighton, Staten Island, with the necessary approaches. The capital stock is to be \$1,000,000, with authority to issue \$4,000,000 of bonds.

#### Eastern Kentucky.

A correspondent informs us that this company has just completed an extension of its road 11½ miles long from Grayson, Ky., to Willard, making the whole length of the road in operation 34½ miles, from Riverton to Willard.

#### Rochester & State Line.

The bill authorizing the City of Rochester to issue at once the remaining \$200,000 of the bonds voted to this road has passed the New York Legislature, and has been approved by the Governor.

#### Louisville, Cincinnati & Lexington.

A circular issued to the bondholders and creditors of this company sets forth in full the proposal of the company which was somewhat incorrectly stated in dispatches published a short time since. The holders of the \$3,000,000 first-mortgage bonds are asked to fund the coupons due January 1 and July 1, 1874, and January 1 and July 1, 1875, and the holders of the second-mortgage bonds to fund the coupons due April 1 and October 1, 1874, and April 1 and October 1, 1875, in the consolidated mortgage bonds of the company, at the rate of 85 and accrued interest; interest on the unmatured

bonds, at 7 per cent., to be deducted. The company agrees that the coupons shall be placed in the hands of E. D. Sayre and J. B. Wilder (President of the company) as trustees, to be held as security; and in case of default in the interest on the new bonds, the holders can return them and receive the coupons with their rights unimpaired. In case of any foreclosure the exchange is to become void.

The floating debt creditors are requested to fund their claims in the company's bonds at the rate of 85 and accrued interest for the second mortgage and Shelby Cut-off bonds.

More than one-fourth of the bondholders and a large part of the floating-debt creditors have accepted the proposal.

The funded debt of the company was as follows, December 31, 1873:

Bond to State of Kentucky, perpetual loan	\$74,519 50
Louisville City bonds	100,000 00
Lexington & Frankfort bonds	25,000 00
Louisville & Frankfort bonds	35,000 00
First-mortgage bonds	3,000,000 00
Second-mortgage bonds	881,000 00
Shelby Railroad bonds assumed	85,000 00
Shelby Cut-off bonds	21,000 00
Consolidated mortgage bonds	9,500 00
Total funded debt (\$21,827 per mile)	\$4,234,519 50

The floating debt was as follows:

Bills payable and accounts with collaterals	\$1,250,882 00
Unpaid coupons due January 1, 1874	109,975 00
Unpaid vouchers and pay-rolls	339,790 00

Total floating debt.....\$1,769,147 00

#### New Jersey Canal.

A bill is before the New Jersey Legislature to charter a company by this name to build a canal with 18 feet depth of water from the Raritan at the mouth of South River southwest to the Delaware at or near the mouth of Assicunk Creek. The canal will be about 40 miles long. The capital stock is to be \$500,000, with power to increase to \$4,000,000, and the corporators are Rodman M. Price, Robert H. Berdel, Wm. Niles, Andrew A. Smalley, William C. Newell, Jenkins Van Schaick, William R. Travers, C. Godfrey Gunther and John McGregor.

#### New York, New Haven & Hartford.

This company has received 2,500 tons of steel rails, which will be used to complete the substitution of steel for iron both on the main line and on the Shore Line Division.

#### Erie.

Telegraphic dispatches report a strike of freight brakemen on the Susquehanna Division. It is stated that no freight trains were running west of Susquehanna, February 25, and that passenger trains were stopped at Hornellsville, and only the engine and mail car allowed to go through eastward.

#### Milwaukee & St. Paul.

An agreement has been made between this company and the city of McGregor, Ia. The road is to be extended into the city and a depot built there. This agreement, if ratified by both parties, will close a controversy of long standing.

#### Des Moines Valley.

The division of this road between the two new companies organized by the bondholders has been completed. The Keokuk & Des Moines Company takes the line from Keokuk to Des Moines, 161 miles, and the Des Moines & Fort Dodge Company the road from Des Moines to Fort Dodge, 88 miles.

#### New Brunswick.

The Frederickton (N. B.) *Express* says that the Construction Company have decided to proceed with this road as far as Topeka this year. Preparation will also be made for the construction of the bridge at Woodstock. Work will be continued through the winter in the neighborhood of Hartland, Moquart and Muniac. The traffic over the road between St. Mary's and Woodstock is steadily increasing.

#### Washington City, Virginia Midland & Great Southern.

The contract for the unfinished section of the Danville Extension, near Danville, Va., has been let to J. R. Fitzpatrick. The contractor has commenced work and is to complete his job in three months.

#### Worcester & Nashua.

At a special meeting held in Worcester, Mass., February 21, the stockholders, by a majority of 1,491 shares, voted to guarantee the bonds of the Nashua & Rochester Railroad Company to an amount not exceeding the capital stock of that company. It was also resolved to authorize the directors to buy any part of the stock or bonds of the Nashua and Rochester Company.

#### The Hoosac Tunnel Line.

The Boston *Advertiser* says that a bill has been prepared by the chairman of the committee and is under consideration by the committee. The general features of the bill are the formation of a trust company into which the tunnel and the roads forming the tunnel line are to be merged, the respective interests to be fixed on the basis of their traffic capacities. There are no compulsory features, the companies being left free to decline to join in this arrangement if they prefer. The proposed corporation is to be managed by a board of trustees in which the State is to have a majority.

#### St. Paul & Pacific.

The committee of the Minnesota State Senate which has been investigating the elevator business on this road has submitted to the Senate resolutions directing the Attorney General to commence proceedings to vacate the charter of the company. The reasons given are that the company granted first to W. B. Litchfield and afterwards to W. F. Davidson and associates the exclusive right to build elevators and grain warehouses along the line of the road and the right to receive, store and ship all the grain brought to the road. The committee holds that the granting of such a monopoly is a misuse of the chartered rights of the company and a usurpation of powers.

#### Central, of New Jersey.

A bill is before the New Jersey Legislature to authorize this company to increase its capital stock by \$10,000,000, the present capital stock being \$20,000,000.

#### Chesapeake & Ohio.

This company gives a notice that it is now prepared to issue income bonds to holders of the 6 per cent. mortgage bonds for the four coupons numbered 8, 9, 10 and 11, as proposed in the circulars heretofore issued. The coupons are to be deposited with the New York Guarantee & Indemnity Company, No. 52 Broadway, New York, and the bonds will be issued at the office of the Chesapeake & Ohio Company, No. 9 Nassau street, New York. The coupons to be funded may be enclosed directly to the office of the company. It is stated that the holders of a large proportion of the bonds have agreed to fund their coupons as proposed.

#### New York & Oswego Midland.

Messrs. Heidelbach, Frank & Co., who represent foreign holders of over \$2,000,000 of first-mortgage bonds, have issued a circular in which the plan of reorganization proposed by the committee is severely dealt with. They propose no definite plan, but claim that it is necessary for the first-mortgage bondholders to protect themselves, and to compel a foreclosure